711D SYSTEM

ADJUSTMENT MANUAL

March, 1982

SL-2500

SL-2500 BETA III/II RECORD
BETA III/II/I PLAYBACK

Beta
VIDEO CASSETTE RECORDER
SONY®

MICROFILM

Consumer
VIDEO

TABLE OF CONTENTS

1. PREPARATION FOR MECHANICAL SECTION CHECK, ADJUSTMENT, AND REPLACEMENT

1-1. Removal of the Case 1-1
1-2. Removal of TU-21, RR-1 Boards 1-2
1-3. Operation without Cassette Compartment Installed . . . 1-3
1-3-1. Completing Threading without Cassette, under FL Cassette Compartment Removed 1-3
1-3-2. Playback without Cassette Installed 1-4
1-3-3. Record Mode without Cassette Installed 1-4
1-4. List of Service Units and Tools 1-5

2. PERIODIC CHECK AND MAINTENANCE

2-1. Maintenance after Repair 2-1
2-1-1. Rotary Head Disc Assembly 2-1
2-1-2. Cleaning of the Tape Transportation System 2-1
2-1-3. Cleaning of the Drive System 2-1
2-2. Periodic Check Items 2-1

3. CHECK, ADJUSTMENT, AND REPLACEMENT PROCEDURES

3-1. Replacement of Roraty Head Disc Assembly 3-1
3-1-1. Removal of Rotary Head Disc Assembly 3-1
3-1-2. Replacement 3-1
3-2. Video Head Dihedral Adjustment 3-2
3-3. Replacement and Adjustment of Drum Assembly 3-3
3-3-1. Replacement 3-3
3-3-2. Motor Clearance Adjustment when Replacing Drum Assembly 3-4
3-4. Replacement and Adjustment of Capstan Motor 3-4
3-4-1. Removal of the Capstan Motor 3-4
3-4-2. Perpendicular Adjustment of Capstan Shaft 3-5
3-5. Removal of Tension Pick-up Assembly 3-5
3-6. Removal of FL Cassette Compartment Assembly 3-6
3-7. Adjustment of FL Cassette Compartment Assembly . . 3-7
3-7-1. Mounting of FL Cassette Compartment Assembly . 3-7
3-7-2. Check and Adjustment of Cassette In Switch Operation 3-7
3-7-3. Check and Adjustment of Cassette Up Switch Operation 3-8
3-7-4. Check and Adjustment of Cassette Down Switch Operation 3-9
3-7-5. Check and Adjustment of Cassette Door Assembly and Rail Clearance 3-9
3-7-6. Positioning of Left/Right Gears when Assembling . . 3-10
3-8. Removal of Reel Motor 3-10
3-9. Unthreading Check 3-11
3-10. S Threading Ring Replacement and Adjustment 3-12
3-10-1. Preparation for Removal of S Threading Ring 3-12
3-10-2. Removal of S Threading Ring 3-14
3-10-3. Checking Slider Stopper Mounting 3-15
3-10-4. Replacement of S Threading Ring 3-15
3-11. Adjustment of No. 2 and No. 3 Guide Heights 3-16
3-12. Check and Adjustment of Pinch Press Limiter Clearance 3-16
3-13. Brake Operation Check and Brake Solenoid Adjustment 3-17
3-14. Check and Adjustment of Microswitch Position 3-18
3-14-1. Check and Adjustment of Threading End Switch (TE Switch) Position 3-18
3-14-2. Check and Adjustment of Unthreading End Switch (UTE Switch) Position 3-19
3-15. Forward/Back Tension Measurement 3-20

4. TAPE PATH ADJUSTMENT

4-1. Tracking Adjustment 4-1
4-1-1. Preparation 4-2
4-1-2. Entrance Side Adjustment 4-2
4-1-3. Exit Side Adjustment 4-4
4-1-4. Reverse Waveform Confirmation 4-4
4-2. Adjustment for Removal or Replacement of the ACE Assembly 4-5
4-2-1. Tracking Adjustment 4-5
4-2-2. Audio Head (ACE Assembly) Azimuth Adjustment . 4-6
4-2-3. CTL Head (ACE Assembly) Position Adjustment . . 4-6
4-2-4. Audio Head (ACE Assembly) Height Adjustment . . 4-8
4-3. Adjustment for Removal or Replacement of the Capstan Motor 4-7

5. ELECTRICAL ALIGNMENT

5-1. Power Supply Check (SS-10 Board) 5-3
5-2. System Control Check (SS-10 Board) 5-3
5-3. Servo System Alignment 5-4
5-3-1. Reel Servo System Alignment 5-4
5-3-2. Drum Servo System Alignment 5-4
5-3-3. Capstan Servo System Alignment 5-5
5-3-4. Swing Search Servo Adjustment 5-7
5-4. Video System Alignment 5-10
5-4-1. Playback System Alignment 5-10
5-4-2. Slow Motion Playback System Alignment 5-10
5-4-3. Record System Alignment 5-12
5-5. Audio System Adjustment (VA-3 Board) 5-15
5-6. Timer Adjustment 5-16
5-7. Channel Selection Adjustment 5-16

SECTION 1
PREPARATION FOR MECHANICAL SECTION CHECK, ADJUSTMENT, AND REPLACEMENT

1-1. REMOVAL OF THE CASE

1-1-1. Removal of the Case and Front Panel

1) Unscrew the four screws (1).

2) Remove upper case (2) in the direction of arrow (A).

3) Unscrew the ten screws (3) on the lower panel assembly (4) and remove it.

4) Remove the T.V channel plate holder (5).

5) Unscrew the two front panel screws (6).

6) Remove the front panel assembly by pulling in the direction of arrow (B), after disengaging the five hooks (7) from the main body.

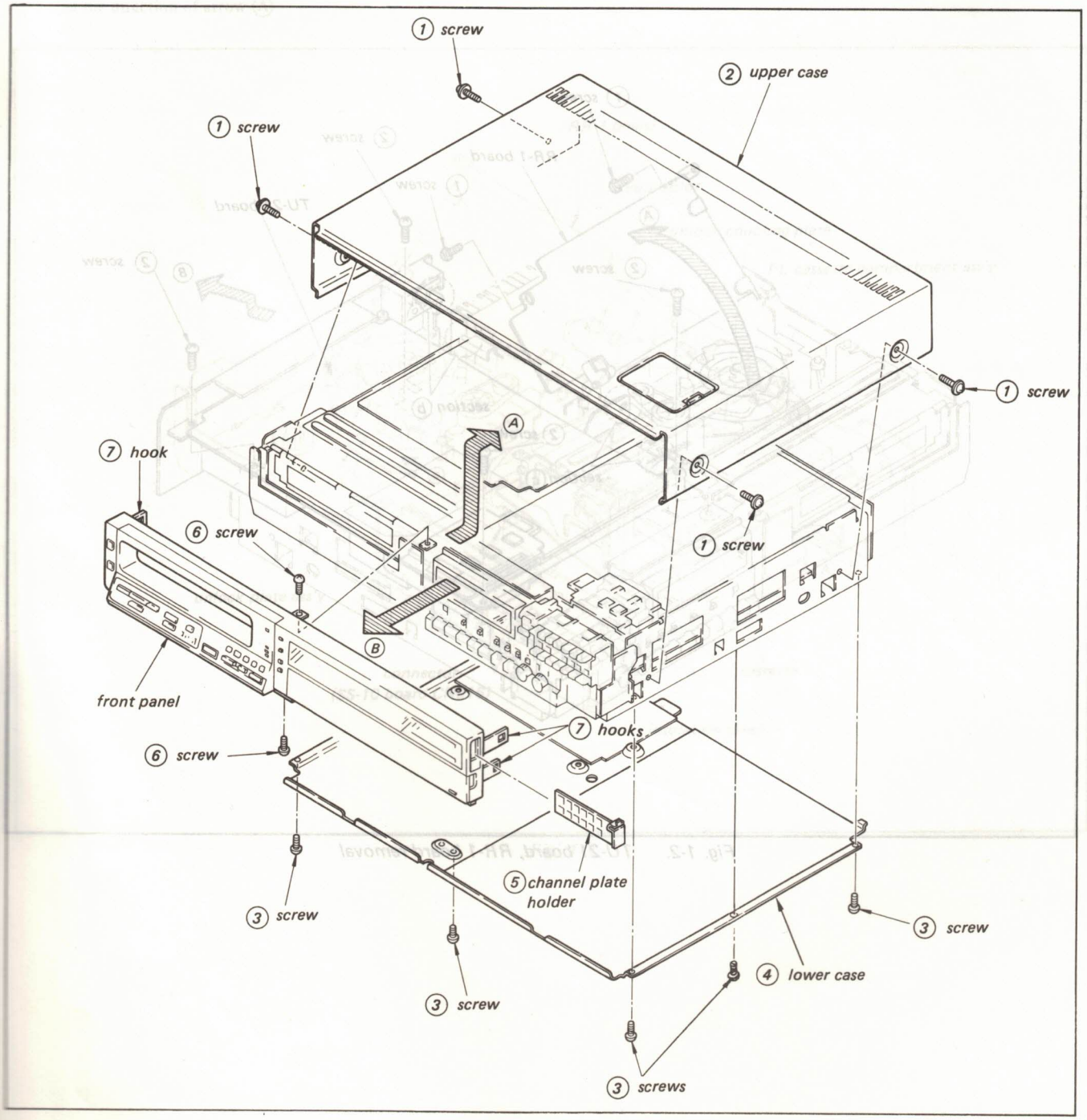


Fig. 1-1.

1-2. REMOVAL OF TU-21, RR-1 BOARDS

1) Unscrew the two screws (1) on the RR-1 board.

2) Open RR-1 board in the direction of arrow (A).

3) Unscrew the four screws (2) holding TU-21 board.

4) Unfasten sections (b), (c).

5) Move TU-21 board in the direction of arrow (B) to remove.

Note: The TU-21 board is removed with the connectors on the reverse side of the board still attached. Do not move more than necessary.

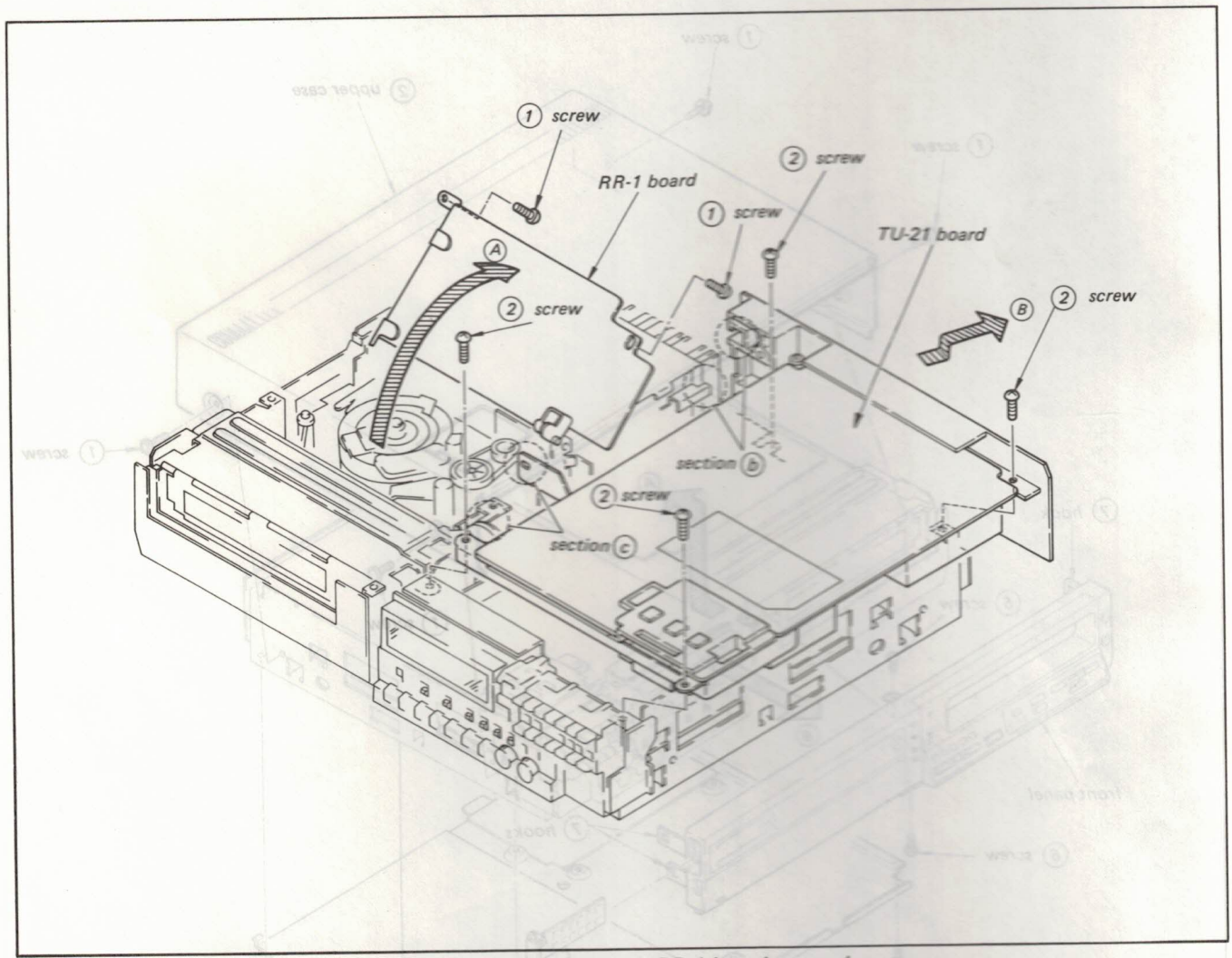


Fig. 1-2. TU-21 board, RR-1 board removal

1-3. OPERATION WITHOUT CASSETTE COMPARTMENT INSTALLED

1-3-1. Completing Threading without Cassette, Under FL Cassette Compartment Removed (This state is called "STOP mode" in this guide.)

1) Place the FL cassette compartment on top of the SS-10 board. (Be sure to spread an insulation sheet over the board.)

Note: See 3-6 for removal of FL cassette compartment.

2) Connect the two connector harnesses. (SS-10 board CN616 and RR-1 board CN302)

3) Insert a cassette into the FL cassette compartment and push in the direction of arrow Ⓐ.

[To EJECT in this state]

1) Press EJECT button.

2) Just before completion of unthreading, T slider assembly pushes unlock plate assembly in the direction of arrow ⓐ.

3) Since the unlock plate assembly is incomplete, because of the separated F.L cassette compartment, the unlock coupling plate under this compartment should be pulled toward ⓑ. This must be done during the final moments of unthreading to EJECT the cassette.

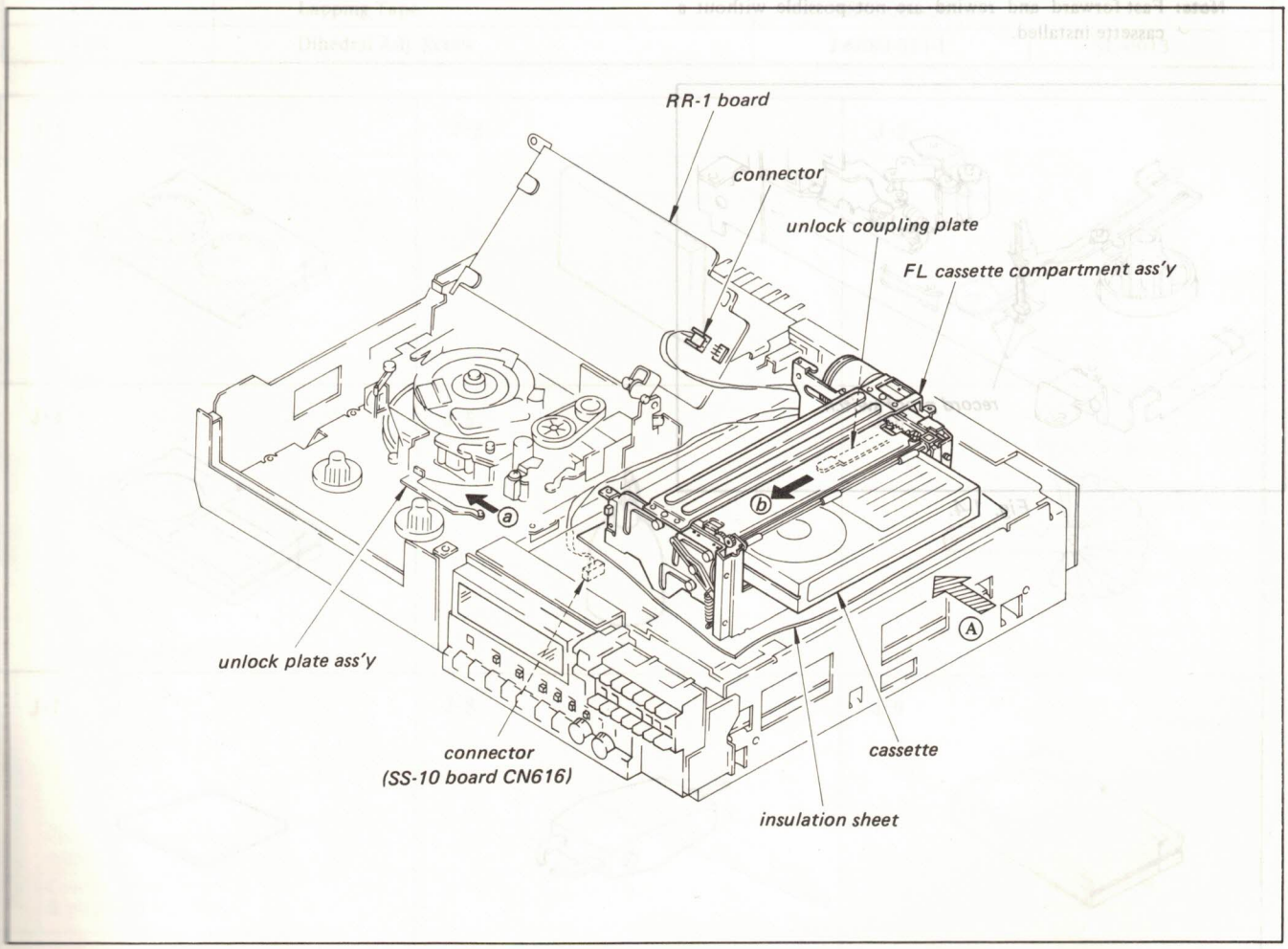


Fig. 1-3.

1-3-2. Playback without Cassette Installed

Press the playback button after setting the STOP mode in step 1-3-1.

1-3-3. Record Mode without Cassette Installed

1) Threading as explained in 1-3-1 and press the record proof switch as shown in Fig. 1-4.

2) Hold this switch down and press PAUSE button while pressing PLAY button.

3) This is PLAY PAUSE mode. Next press REC button to achieve REC PAUSE mode.

4) Press the PAUSE button to release PAUSE mode, and REC mode results.

Note: Fast-forward and rewind are not possible without a cassette installed.

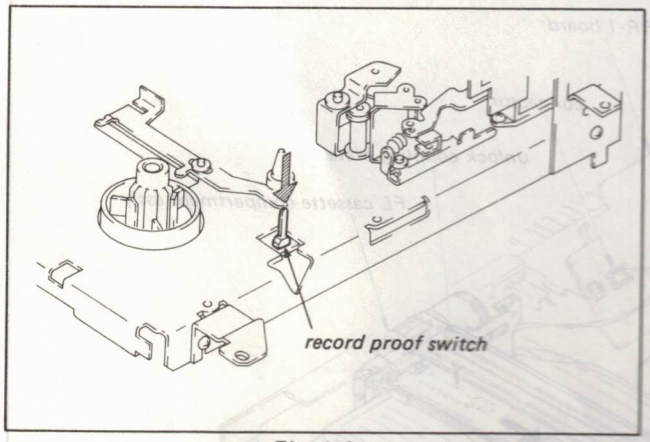
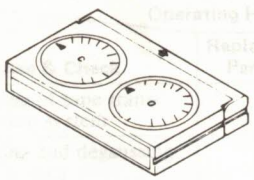


Fig. 1-4.

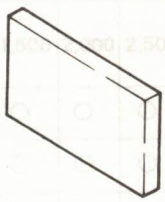
1-4. LIST OF SERVICE UNITS AND TOOLS

Ref. No.	Name	Part No.	Fixture No.
J-1	Forward-Back Tension Measurement Tape	J-6080-003-C	SL-0003C
J-2	Parallel Plate	J-6086-750-A	SL-0657
J-3	Small Adj. Mirror	J-6080-029-A	SL-5052
	Spare Mirror	J-6080-030-1	
J-4	Alignment Tape	8-969-995-71	KR5-1S
J-5	Cleaning Fluid	Y-2031-001-0	
J-6	Thickness Gauge	9-911-053-00	
J-7	Cleaning chamois	Z-034-697-00	
J-8	Head Demagnetizer		
J-9	Lapping Tape	8-888-004-00	
J-10	Dihedral Adj. Screw	J-6080-013-1	SL-0013

J-1

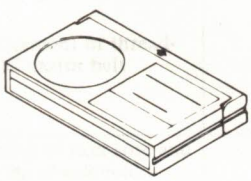


J-2



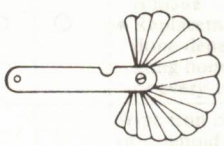
J-3

J-4



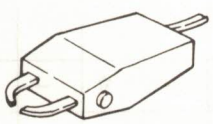
J-5

J-6

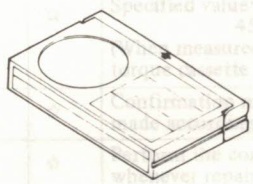


J-7

J-8



J-9



J-10

SECTION 2
PERIODIC CHECK AND MAINTENANCE

The following maintenance and periodic checks are recommended to ensure optimum machine function and performance and to prolong machine and tape life.

2-1. MAINTENANCE AFTER REPAIR

Carry out maintenance work for the following items after repairing the machine regardless of the period of use.

2-1-1. Rotary Head Disc Assembly

1) Place a piece of chamois (tool Ref. No. J7) soaked in cleaning fluid (tool Ref. No. J5) lightly against the rotary drum assembly and clean the rotary head disc assembly by slowly rotating it by hand. (Important-Do not clean by rotating with the motor on.)

2) Do not clean the head tip by moving the chamois in a vertical direction. This may damage the head tip.

2-1-2. Cleaning of the Tape Transportation System

Clean the tape contact surfaces, such as the tape guide, drum assembly surfaces, capstan, and pinch roller using cleaning piece etc. soaked in cleaning fluid.

2-1-3. Cleaning of the Drive System

Clean the driving elements (threading motor belt, reel base surfaces, etc.) using a cloth soaked in cleaning fluid.

2-2. PERIODIC CHECK ITEMS

Carry out maintenance checks for the following items depending on the duration of use.

	Maintenance & Check	Replacement Part No.	Operating Hours (H) 500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	Remarks
Tape Transportation System	Cleaning of tape transportation system		○	○	○	○	○	○	○	○	○	○	This cleaning must be done whenever a repair is made.
	Cleaning and degaussing of ACE ass'y		○	○	○	○	○	○	○	○	○	○	
	Cleaning & degaussing of video disk ass'y		○	○	○	○	○	○	○	○	○	○	The life of the head varies, depending on operational conditions and method.
Driving System	Replacement of threading DC motor belt		○	○	○	○	○	○	○	★	○	○	• This cleaning must be done whenever a repair is made. • Replacement must be done depending on operating hours on the table, or every two years.
	Cleaning of iron core and opening of solenoid		–	–	–	○	–	–	–	○	–	–	Wipe iron core and opening of solenoid with dry cloth.
Performance Confirmation	Abnormal sound		☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	Adjust or replace the section which causes abnormal sound.
	Measurement of FWD back tension		–	☆	–	☆	–	☆	–	☆	–	☆	Confirmation must be made according to section Specified value: 45 ~ 48 g·cm (When measured with torque cassette tape)
	Confirmation of brake system		–	☆	–	☆	–	☆	–	☆	–	☆	Confirmation must be made according to section
	Confirmation of record & playback functions		☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	Perform the confirmation whenever repair is made.

○ Cleaning ★ Replacement ☆ Confirmation

Note: When overhauling, refer to the above for part replacement.

SECTION 3
CHECK, ADJUSTMENT, AND REPLACEMENT PROCEDURES

3-1. REPLACEMENT OF ROTARY HEAD DISC ASSEMBLY

3-1-1. Removal of Rotary Head Disc Assembly

1) Unscrew the two screws (1) holding the damper assembly and remove it.

2) Unscrew hexagonal socket bolt (2) with an allen wrench.

3) Unscrew the two screws (3) and remove the upper drum assembly.

Note: Remove the upper drum, without moving the adjust plate. Be very careful not to move the adjust plate, or tape path will be affected.

4) Unsolder the rotary head disc relay board. (four blue and white lead wires)

5) Unscrew the two screws (4) and remove the rotary head disc assembly.

Note: Be very careful not to touch the head tip, or touch it against anything.

3-1-2. Replacement

1) Position the rotary head disc paying attention to the direction of the blue and white lead wires.

2) Tighten the screws (4) and solder the lead wires.

Note: Solder securely, being careful not to break the lead wires.

3) Be careful not to move the adjust plate, as when removing the upper drum. Lightly tighten the screws (3), clamp hexagonal socket bolt (2), then securely tighten the screws (3).

Caution: Be careful not to touch the head tip when replacing the drum.

Note: When replacing the rotary drum head, it may be difficult to remove it from the head disc. In this event, follow the procedure below. (Fig. 3-2)

i) Unscrew screws (3) on the head disc.

ii) At this point, if it is difficult to remove the head disc, place the two screws removed in step i) in the two holes 90° away from the removal holes, and screw them in alternately, and gradually. The head disc will be lifted up by the force of the screws and can be removed easily.

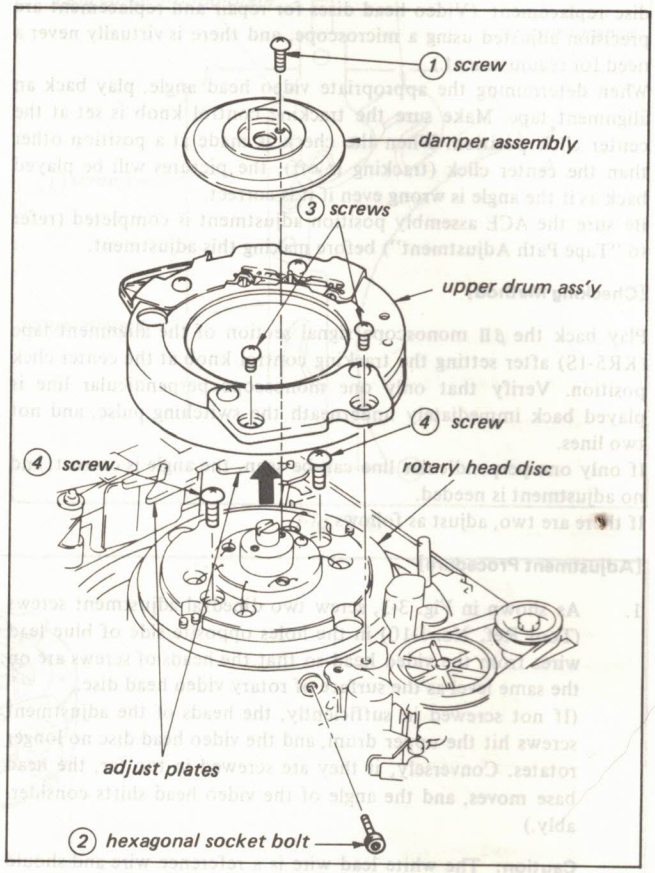


Fig. 3-1.

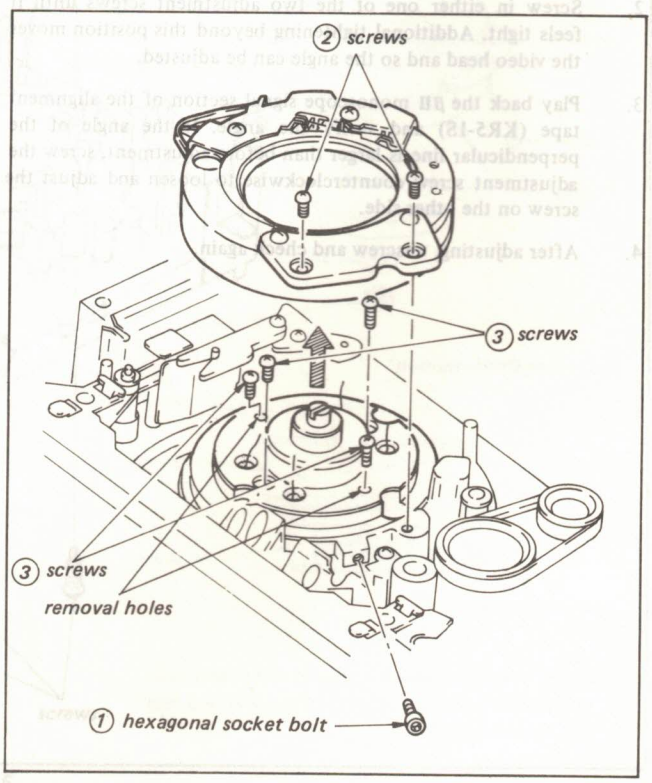


Fig. 3-2.

3-2. VIDEO HEAD DIHEDRAL ADJUSTMENT

Generally this adjustment is not necessary except after video head disc replacement. (Video head discs for repair and replacement are precision adjusted using a microscope, and there is virtually never a need for readjustment.)
When determining the appropriate video head angle, play back an alignment tape. Make sure the tracking control knob is set at the center click position. When the check is made at a position other than the center click (tracking is off), the pictures will be played back as if the angle is wrong even if it is correct.
Be sure the ACE assembly position adjustment is completed (refer to "Tape Path Adjustment") before making this adjustment.

[Checking Method]

Play back the βII monoscope signal section of the alignment tape (KR5-1S) after setting the tracking control knob at the center click position. Verify that only one monoscope perpendicular line is played back immediately underneath the switching pulse, and not two lines.
If only one perpendicular line can be seen, the angle is correct, and no adjustment is needed.
If there are two, adjust as follows.

[Adjustment Procedure]

1. As shown in Fig. 3-3, screw two dihedral adjustment screws (Tool Ref. No. J-10) in the holes opposite side of blue lead wires from the video head so that the heads of screws are on the same level as the surface of rotary video head disc.
   (If not screwed in sufficiently, the heads of the adjustment screws hit the upper drum, and the video head disc no longer rotates. Conversely, if they are screwed in too far, the head base moves, and the angle of the video head shifts considerably.)

   Caution: The white lead wire is a reference wire and should never be moved.

2. Screw in either one of the two adjustment screws until it feels tight. Additional tightening beyond this position moves the video head and so the angle can be adjusted.

3. Play back the βII monoscope signal section of the alignment tape (KR5-1S) and verify the angle. If the angle of the perpendicular line is larger than before adjustment, screw the adjustment screw counterclockwise to loosen and adjust the screw on the other side.

4. After adjusting, unscrew and check again.

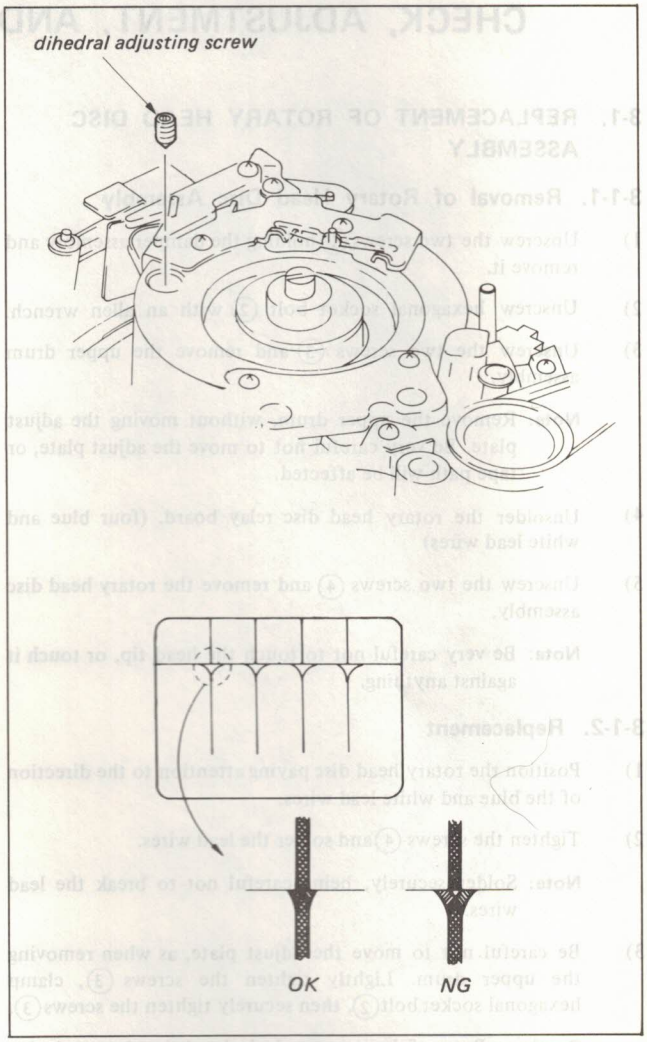


Fig. 3-3. Video head dihedral adjustment

3-3. REPLACEMENT AND ADJUSTMENT OF DRUM ASSEMBLY

3-3-1. Replacement

1) Measure and record the two gaps between the upper drum tape holding section and the adjust plate (Ⓐ in Fig. 3-4). (Do not forget to do this, as the adjust plate mounting position affects the tape path.)

2) Unscrew the screws ① shown in Fig. 3-4. Remove the tape guide ground plate and adjust plates 1 and 2 .

3) Remove the connector, ground terminal, and three drum mounting screws from the rear of the chassis and remove the drum assembly body.

4) Re-assemble the parts in reverse order.

5) Perform to "Tape Path Adjustment" after replacing the drum.

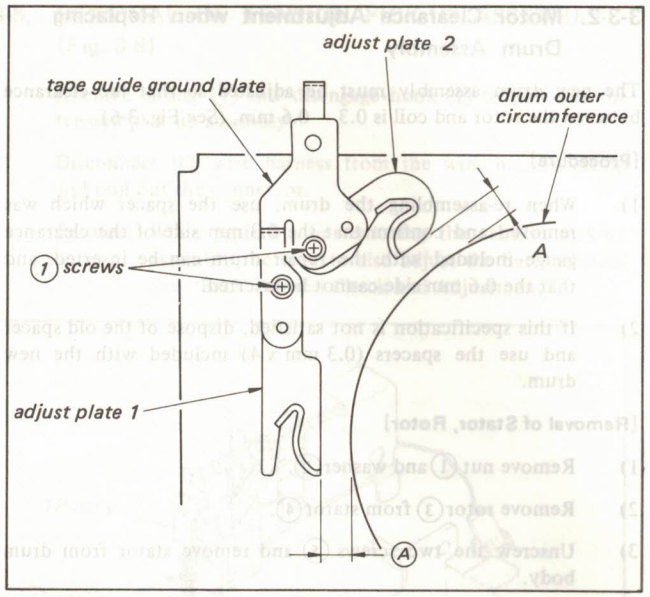


Fig. 3-4.

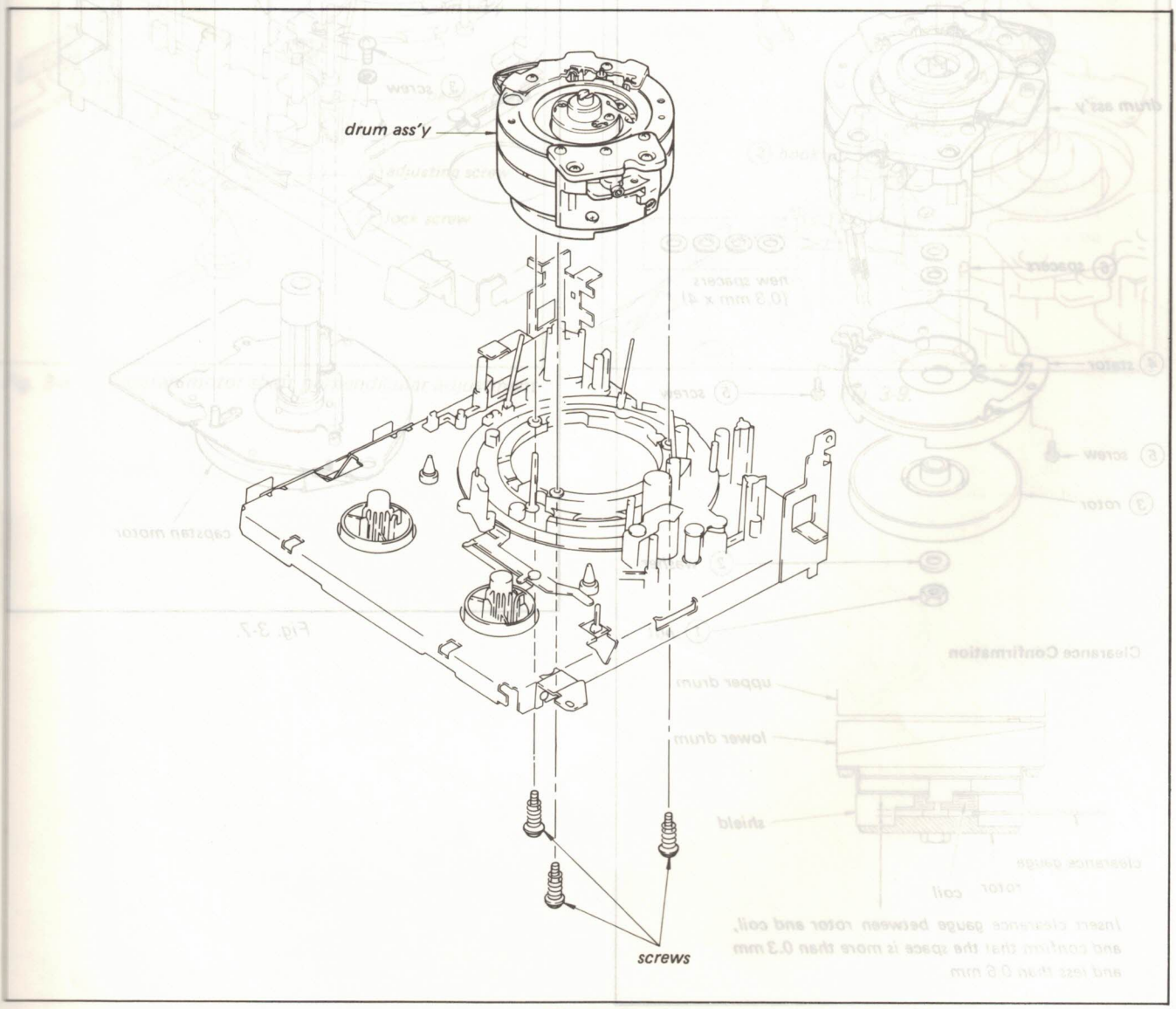


Fig. 3-5.

3-3-2. Motor Clearance Adjustment when Replacing Drum Assembly

The new drum assembly must be adjusted so that the clearance between the rotor and coil is 0.3 – 0.6 mm. (See Fig. 3-6)

[Procedure]

1) When re-assembling the drum, use the spacer which was removed and confirm that the 0.3 mm side of the clearance gauge included with the repair drum can be inserted, and that the 0.6 mm side cannot be inserted.

2) If this specification is not satisfied, dispose of the old spacer and use the spacers (0.3 mm x 4) included with the new drum.

[Removal of Stator, Rotor]

1) Remove nut (1) and washer (2).

2) Remove rotor (3) from stator (4).

3) Unscrew the two screws (5) and remove stator from drum body.

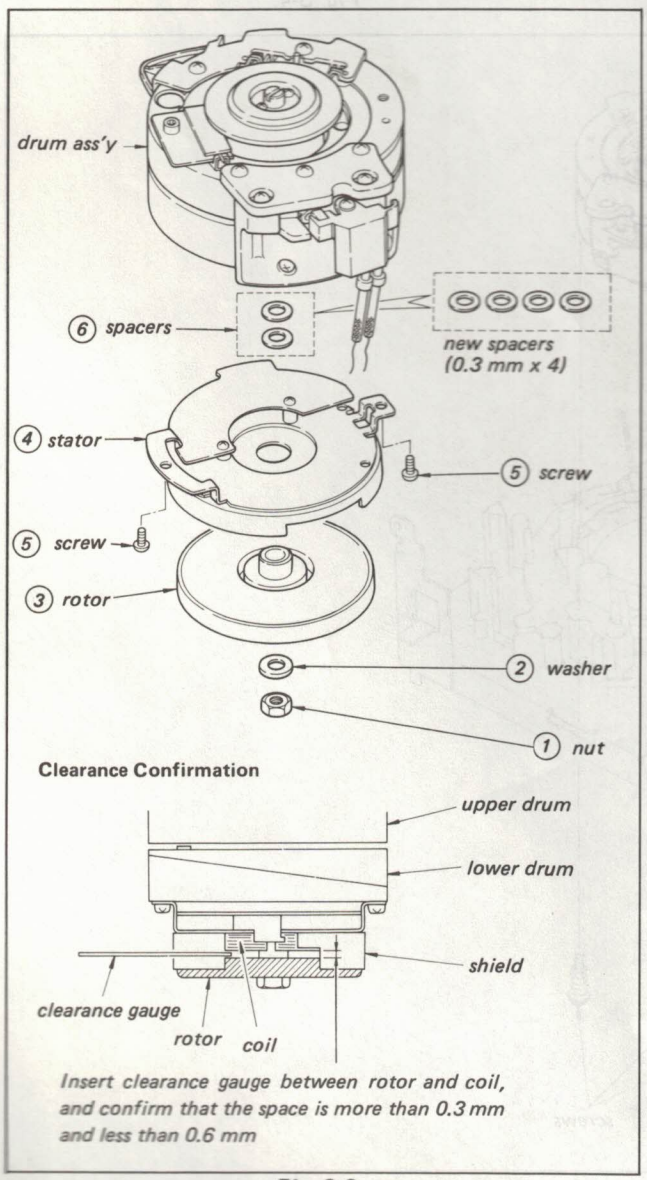


Fig. 3-6.

3-4. REPLACEMENT AND ADJUSTMENT OF CAPSTAN MOTOR

3-4-1. Removal of the Capstan Motor (Fig. 3-7)

Unscrew screws (1), (2), (3) and remove the capstan motor from the bottom of the mechanism chassis

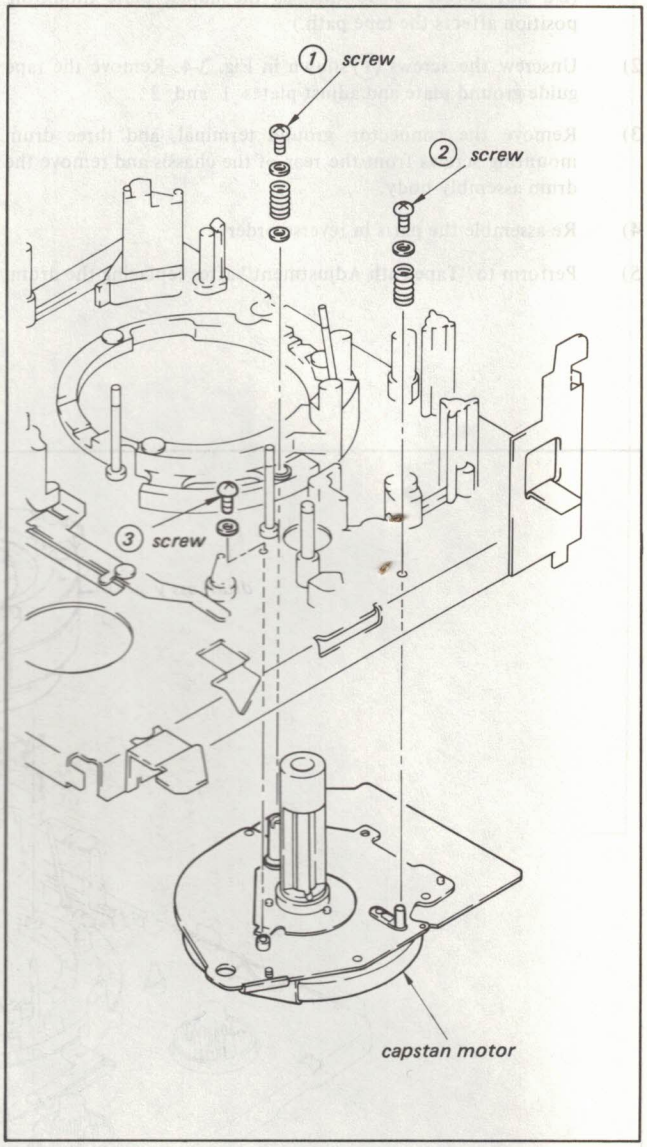


Fig. 3-7.

3-4-2. Perpendicular Adjustment of Capstan Shaft

[Be sure to adjust as follows after the capstan motor has been replaced or removed]

1) Place parallel plate (Tool Ref. No. J-2) on No. 10 guide sleeve of the pinch press arm assembly perpendicularly, as shown in Fig. 3-8.
2) Loosen screw (1).
3) Rotate adjusting screw (2) and align the capstan shaft perpendicularly.
4) Tighten screw (1) and fix the capstan motor.
5) Adjust according to "Tape Path Adjustment".

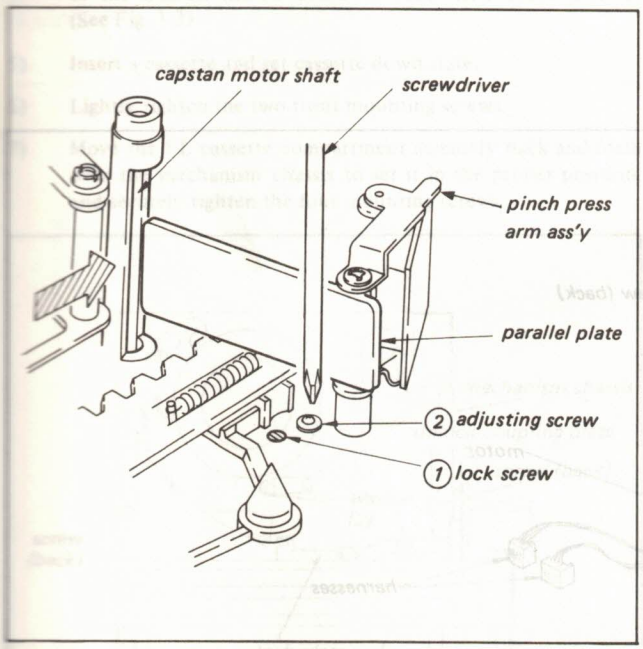


Fig. 3-8. Capstan motor shaft perpendicular adjustment

3-5. REMOVAL OF TENSION PICK-UP ASSEMBLY (Fig. 3-9)

1) Remove spring (1) and disengage hook (2) to pull out the tension pick-up assembly.
2) Disconnect the wire harness from the wire harness clamp and pull out the connector.

Caution: When replacing or removing the tension pick-up assembly, be sure to also adjust the back tension. See "Back Tension Check and Adjustment".

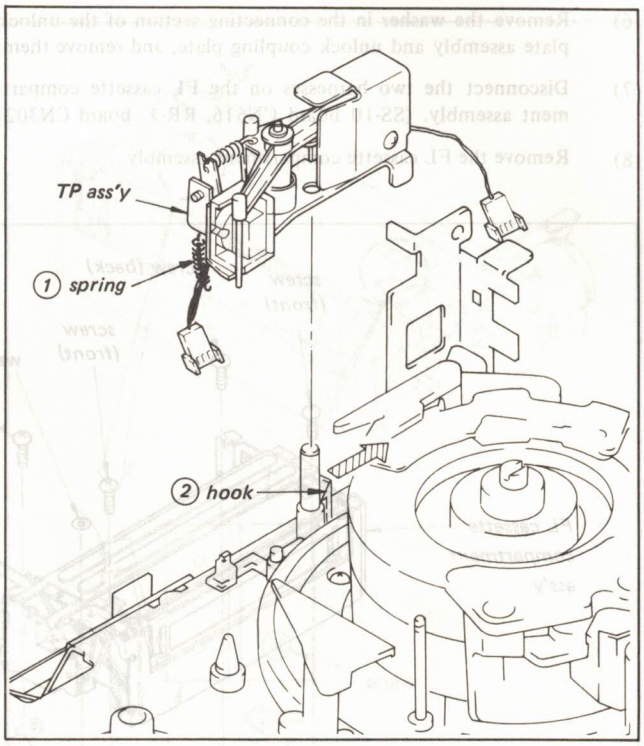


Fig. 3-9.

3-6. REMOVAL OF FL CASSETTE COMPARTMENT ASSEMBLY

1) Remove the TU-21 board
2) Insert a cassette and set cassette down state.
3) Unscrew the two front mounting screws on the FL cassette compartment assembly.
4) EJECT the cassette.
5) Unscrew the remaining two mounting screws (back).
6) Remove the washer in the connecting section of the unlock plate assembly and unlock coupling plate, and remove them.
7) Disconnect the two harnesses on the FL cassette compartment assembly. (SS-10 board CN616, RR-1 board CN302)
8) Remove the FL cassette compartment assembly.

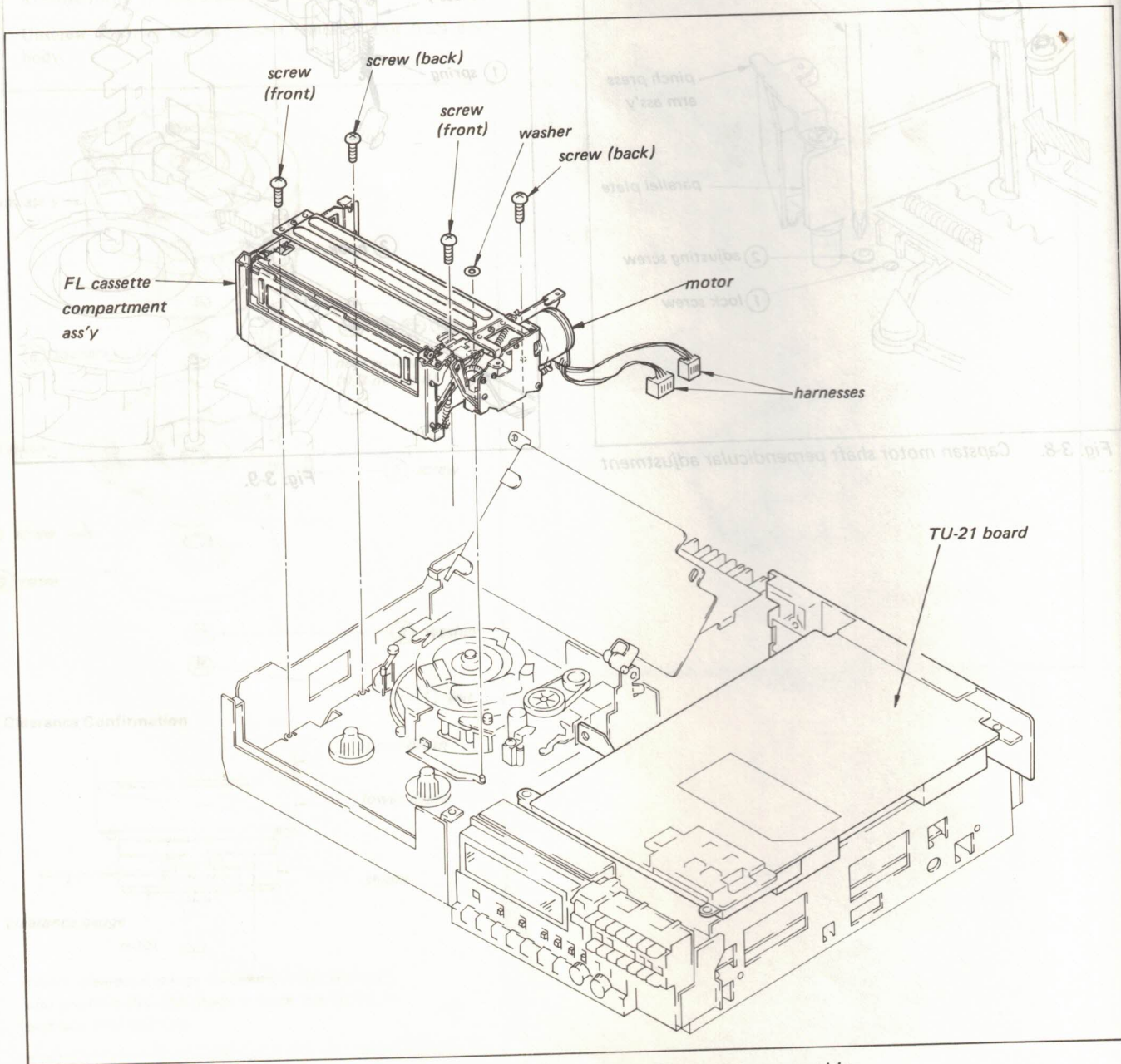


Fig. 3-10. Removal of FL cassette compartment assembly

3-7. ADJUSTMENT OF FL CASSETTE COMPARTMENT ASSEMBLY

3-7-1. Mounting of FL Cassette Compartment Assembly (Fig. 3-11, 3-12)

1) Place the FL cassette compartment assembly in position on top of the mechanism chassis (in cassette up state).

2) Put the unlock plate assembly shaft through the hole in the unlock coupling plate, and install the washer (2). (Fig. 3-12)

3) Lightly tighten the two back mounting screws of the FL cassette compartment.

4) Connect the two harnesses on the FL cassette compartment to the boards. (SS-10 board CN616, RR-1 board CN302) (See Fig. 1-3)

5) Insert a cassette and set cassette down state.

6) Lightly tighten the two front mounting screws.

7) Move the FL cassette compartment assembly back and forth over the mechanism chassis to set it in the proper position, and securely tighten the four mounting screws.

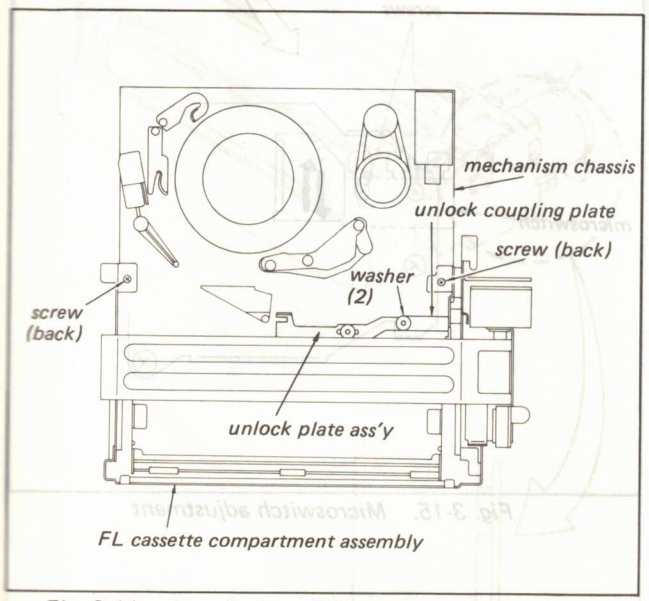


Fig. 3-11. Installation of FL cassette compartment assembly

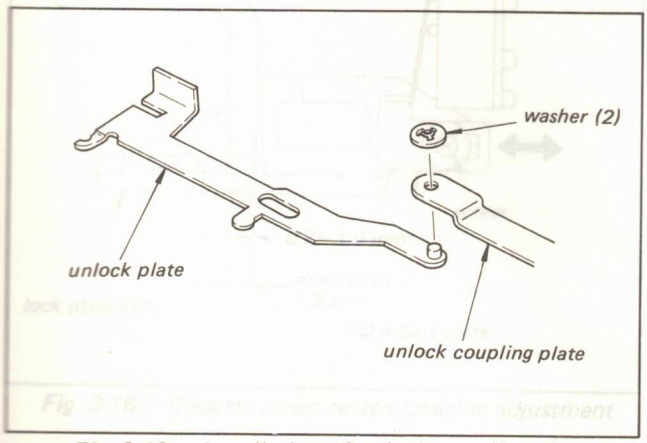


Fig. 3-12. Installation of unlock coupling plate

3-7-2. Check and Adjustment of Cassette In Switch Operation

[Check Procedure]

Confirm that the two microswitches on the left and right go on 0.6 – 1.2 mm before the cassette reaches its final position when inserted in the FL cassette compartment assembly.

[Adjustment Procedure]

Loosen the screw on the microswitch and move the microswitch in the directions of the arrows.

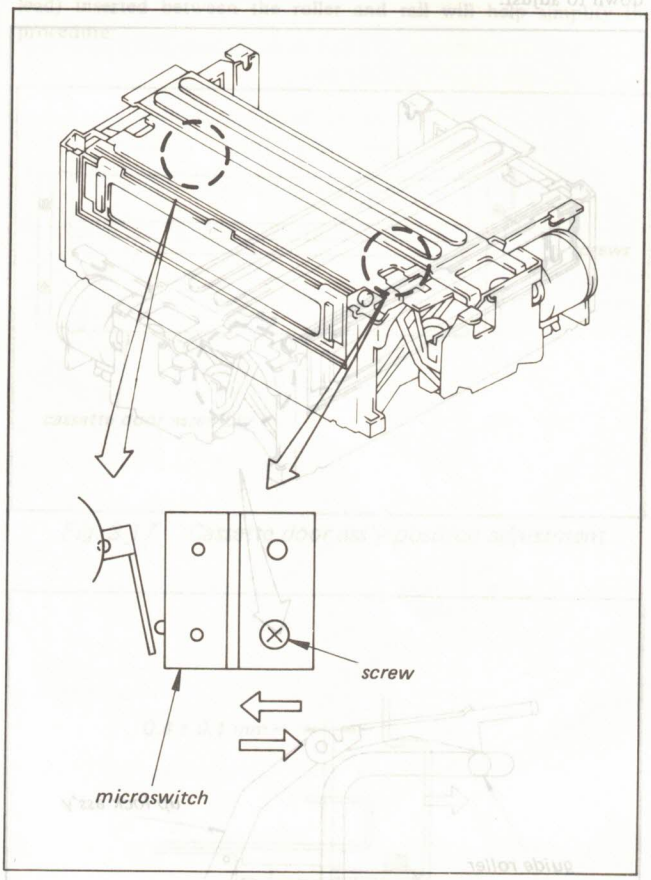


Fig. 3-13.

3-7-3. Check and Adjustment of Cassette Up Switch Operation

[Check Procedure] (refer to Fig. 3-14)

Confirm that the microswitch goes on between when the UP lock assembly goes over the guide roller and before it drops down when the FL cassette compartment assembly motor is rotated slowly in cassette up direction.

[Adjustment Procedure] (refer to Fig. 3-15)

Loosen the screw on the microswitch and move the switch up and down to adjust.

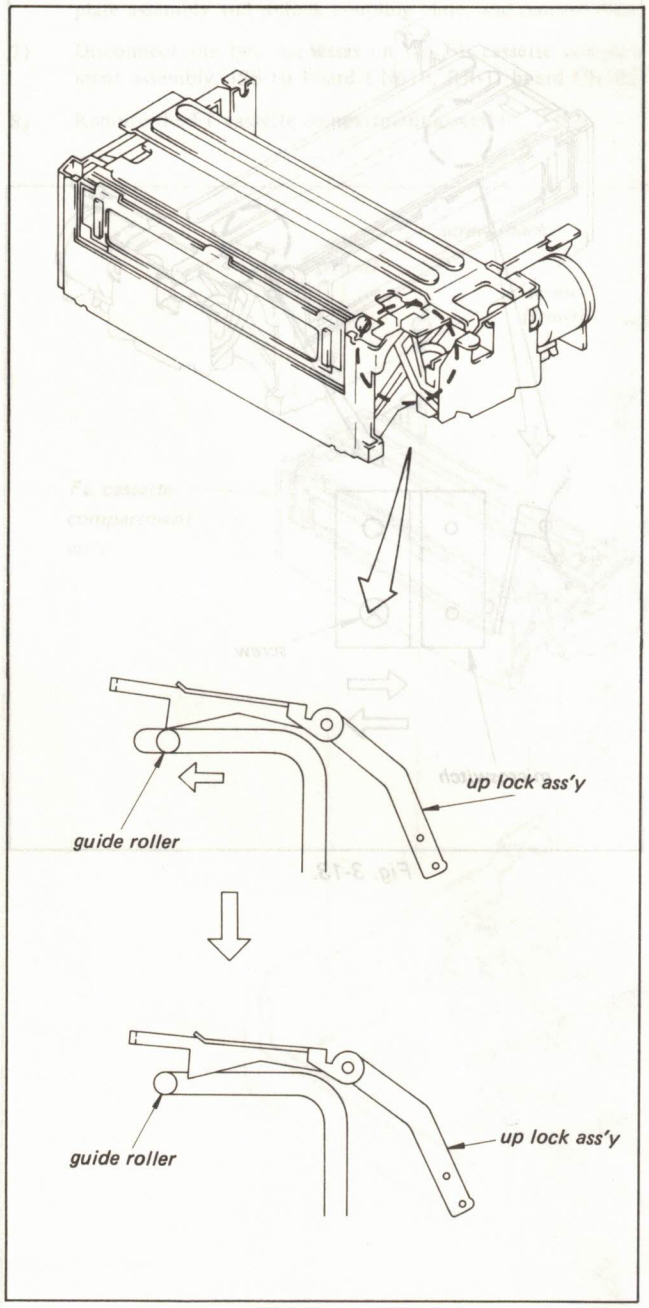


Fig. 3-14. Up lock ass'y movement

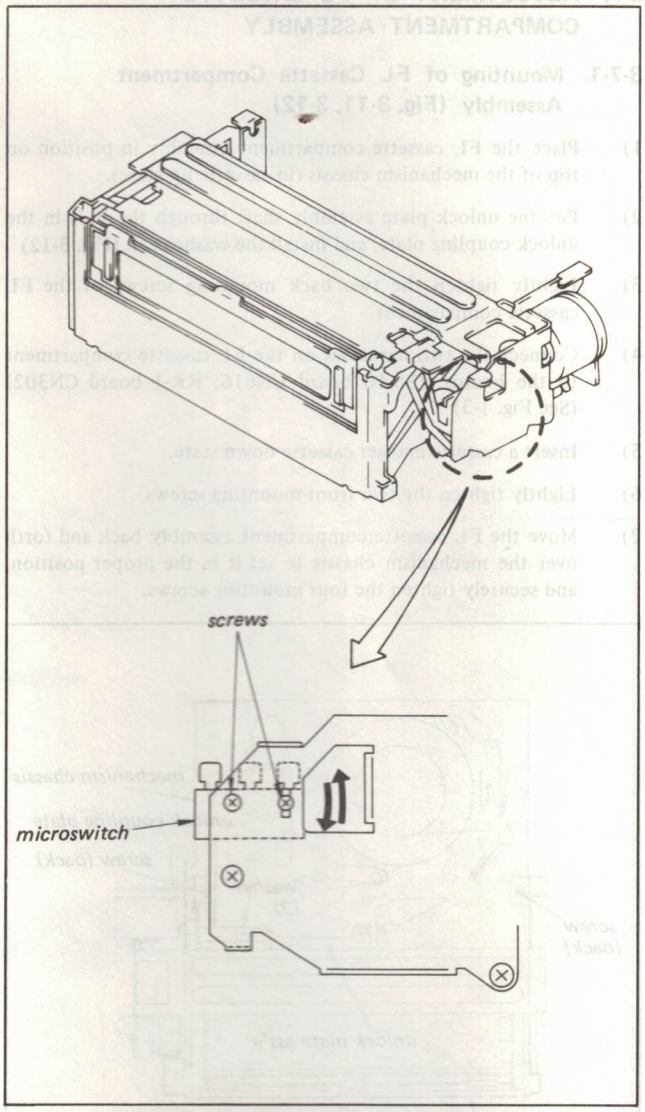


Fig. 3-15. Microswitch adjustment

3-7-4. Check and Adjustment of Cassette Down Switch Operation

[Check Procedure]

1) In cassette down state, confirm that the gap between the front edge of the lock plate assembly and the groove is less than 0.5 mm.

2) Next, move the lock plate assembly slowly in opposition to the spring, and confirm that when the microswitch switches, the gap between the front edge of the lock plate and the groove is 0.7 ~ 1.0 mm.

[Adjustment Procedure]

Loosen the screw on the CD adjust plate, and move the plate in the direction of the arrow to adjust.

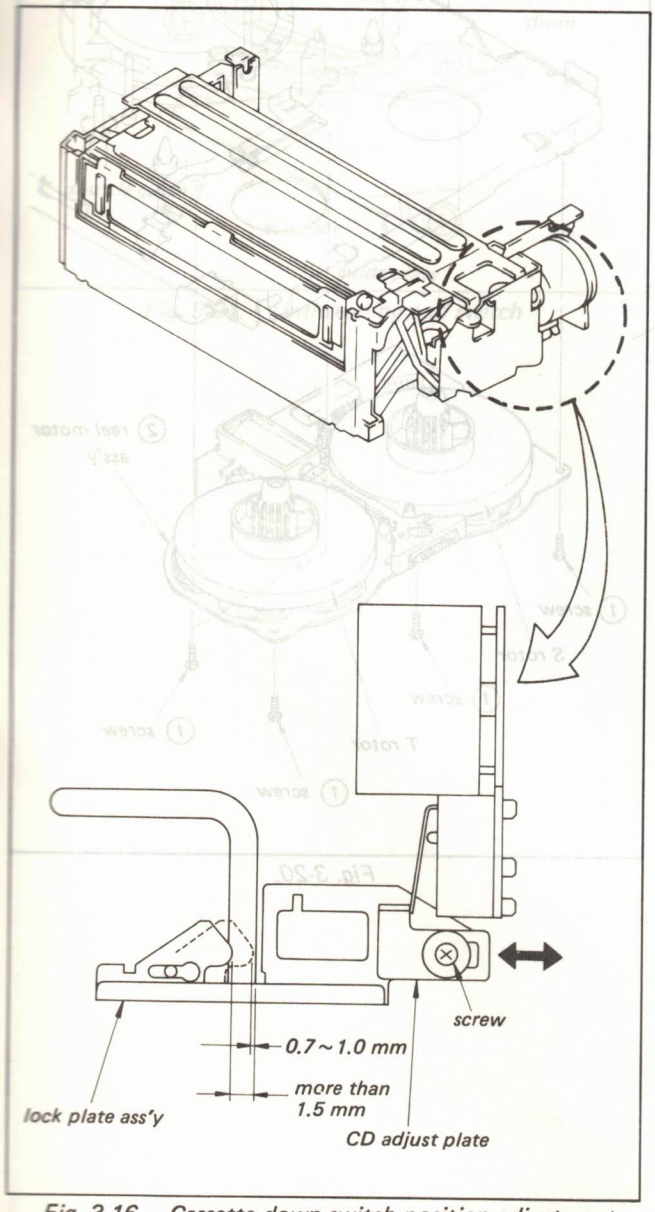


Fig. 3-16. Cassette down switch position adjustment

3-7-5. Check and Adjustment of Cassette Door Assembly and Rail Clearance

[Check Procedure]

Confirm that the clearance between cassette door assembly roller and rail is 0.4 ± 0.1 mm when the play between the assembly and rails is all on one side.

[Adjustment Procedure]

Loosen the two screws on the right-hand rail and adjust for the proper clearance. A wire of 0.4 mm diameter (e.g. 1/8W resistor lead) inserted between the roller and rail will help simplify the procedure.

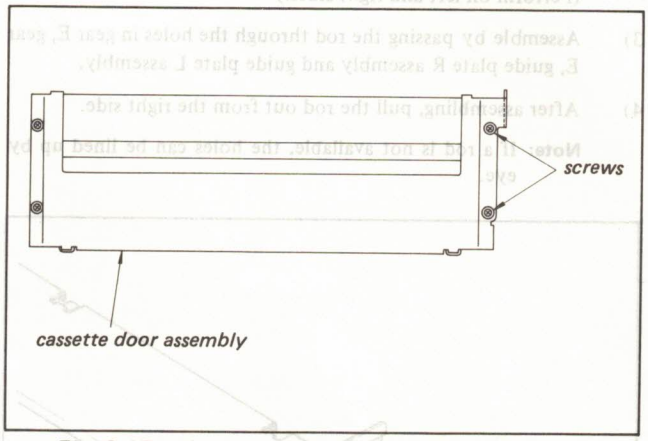


Fig. 3-17. Cassette door ass'y position adjustment

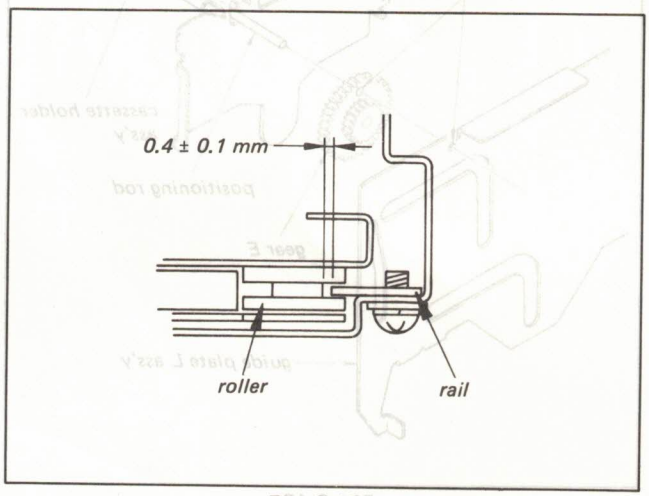


Fig. 3-18.

3-7-6. Positioning of Left/Right Gears when Assembling

[FL Cassette Compartment]

The gear system on the FL cassette compartment assembly is arranged so that the cassette holder moves parallel to the mechanism chassis at all times. Therefore, if these gears are disengaged, they must be properly engaged when re-assembling, or the cassette holder will be on a slant.

[Gear Positioning]

1) Prepare a rod about 1.5 mm thick and 200 mm long.

2) Pass the rod through the hole in the cassette holder assembly. (Perform on left and right sides.)

3) Assemble by passing the rod through the holes in gear E, gear E, guide plate R assembly and guide plate L assembly.

4) After assembling, pull the rod out from the right side.

Note: If a rod is not available, the holes can be lined up by eye.

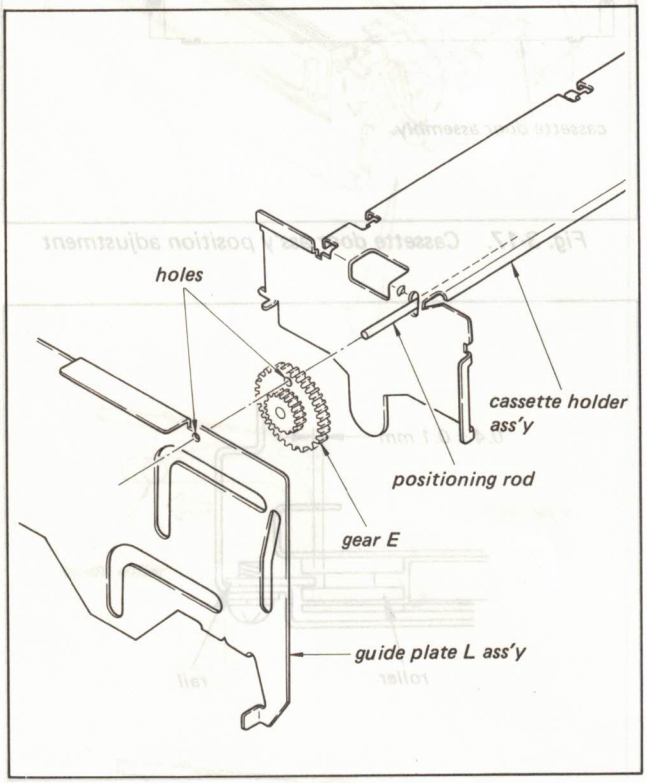


Fig. 3-19.

3-8. REMOVAL OF REEL MOTOR

Unscrew the five mounting screws (1) on the rear of the chassis and remove the reel motor body.

Note: The rotor section can be removed by pulling it straight up.

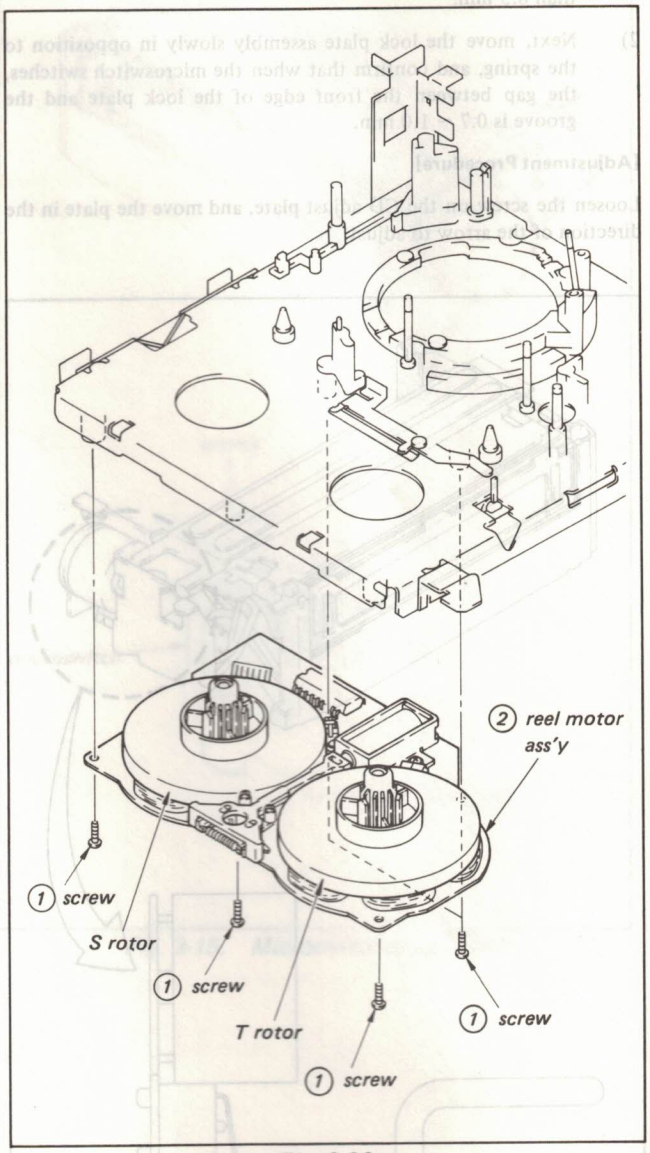


Fig. 3-20.

3-9. UNTHREADING CHECK

1) Set in STOP mode without loading a cassette.

2) Press the EJECT button and unthread. (Unthreading is complete when the T slider shaft returns slightly in the threading direction and stops after pushing the cassette compartment lock release lever.)

3) Check that the actuator for the unthreading end switch is not tripped as shown in Fig. 3-21. (Slowly rotate the threading motor by hand and verify by the click sound.) Adjust according to Paragraph 3-14-2 if necessary.

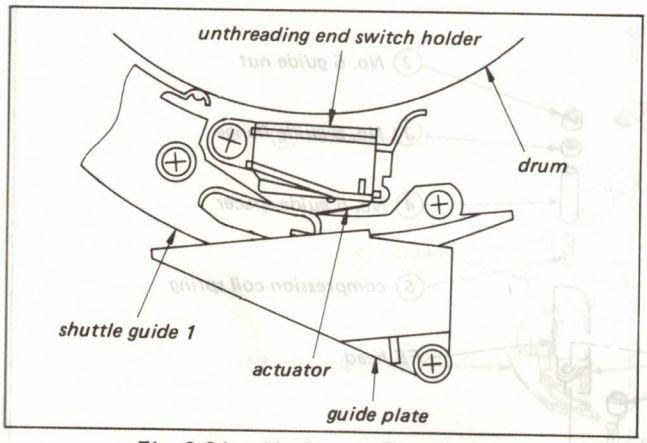


Fig. 3-21. Unthreading end switch

3-10. S THREADING RING REPLACEMENT AND ADJUSTMENT

3-10-1. Preparation for Removal of S Threading Ring

Remove ACE assembly, FE Head and Threading Motor. (Fig. 3-22)

1) Unscrew the Phillips head continuous-thread stepped screw (1).

2) Remove the No. 6 guide nut (2), flange (3), spacer (4) and compression coil spring (5).

3) Remove the two guide adjusting nuts (6) and the ACE assembly and FE head.

Caution: ACE assembly and FE head are connected by a lead. Be careful when removing them. The compression coil spring underneath the ACE assembly does not have to be removed. However, be careful not to lose it.

4) Unscrew the two screws (7) and pull the threading motor assembly up to remove.

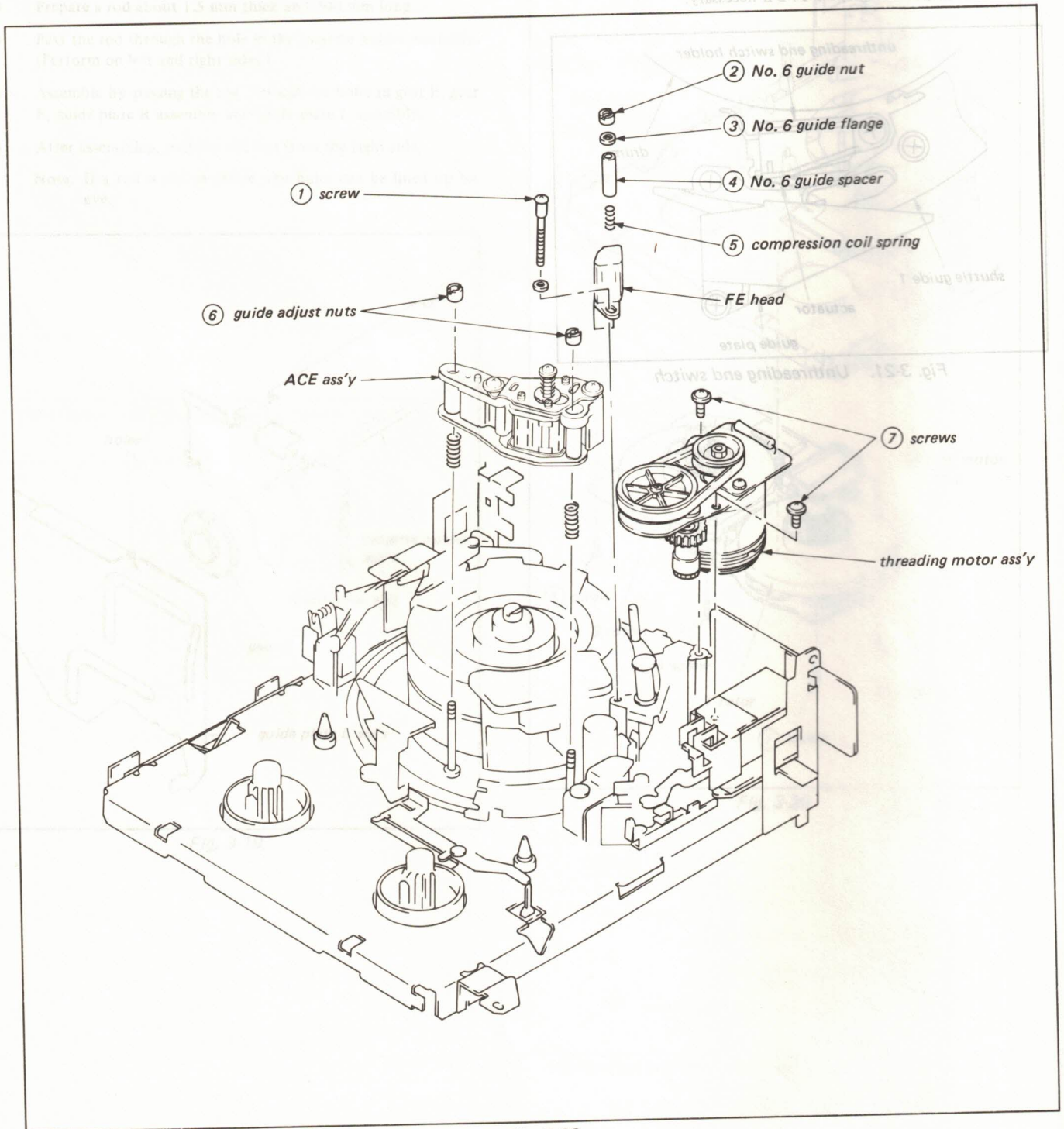


Fig. 3-22.

[Removal of Other Parts] (Fig. 3-23)

1) Measure the gap between the upper drum and adjust the plate as in the replacement of the drum assembly. (Fig. 3-5)

2) Unscrew the screws (1) and remove the tape guide ground plate (2) and adjust plate (3).

3) Unscrew the two screws (4) and remove the holder assembly (5).

4) Unscrew screw (6) and remove the guide plate (7).

5) Unscrew the two screws (8) and five screws (9) to remove the shuttle guide 1 (10) and 2 (11), as well as the slant base assembly (12).

6) Unscrew screw (13) and remove the pin recliner (14).

Caution: When the guide plate is removed, do not thread or unthread with the shuttle guide mounted.

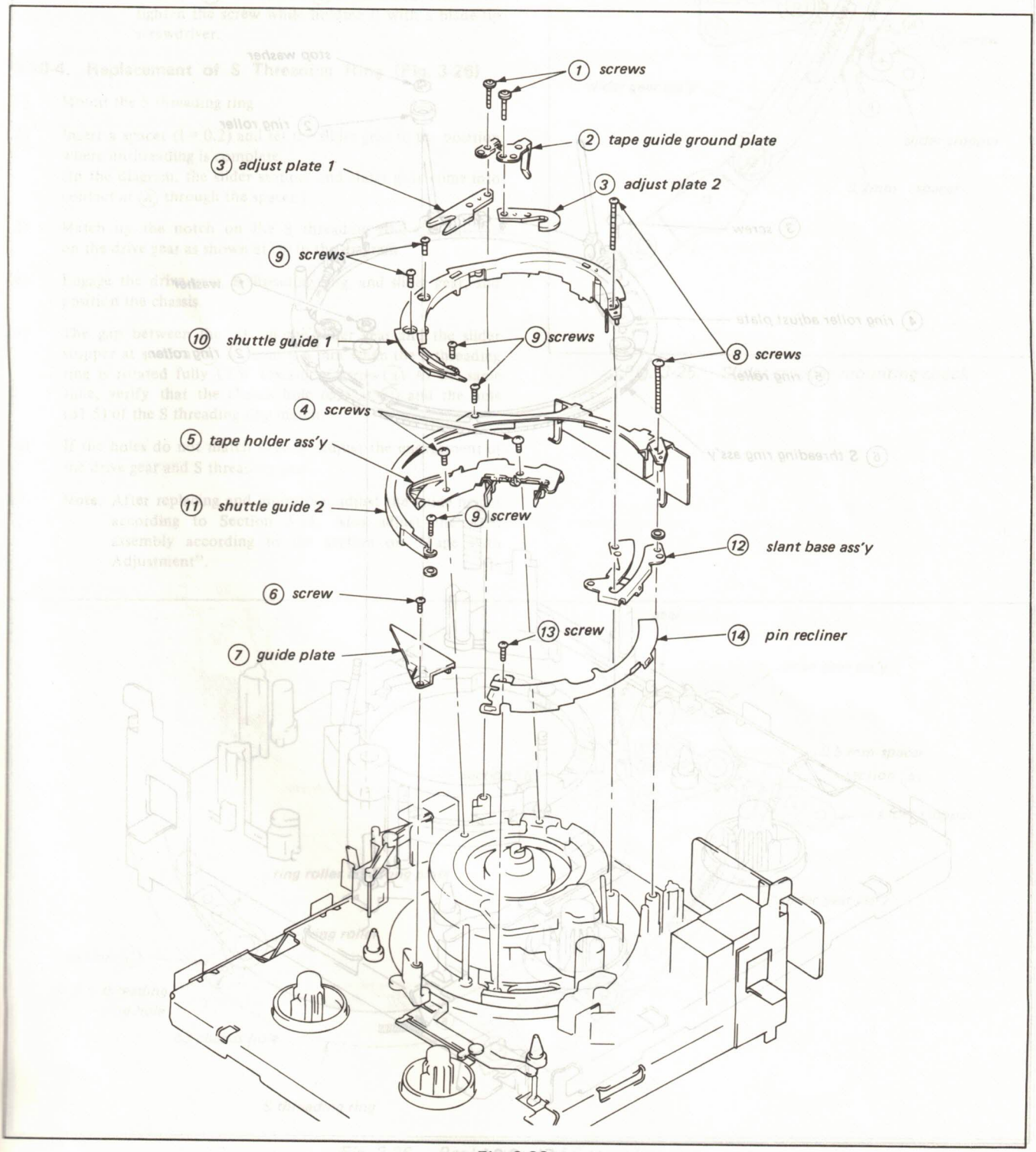


Fig. 3-23.

3-10-2. Removal of S Threading Ring (Fig. 3-24)

1) Remove the spring of the lock arm assembly. (Refer to Paragraph 3-14-1, Fig. 3-31)

2) Remove stop washer (1) and ring roller (2).

3) Remove the UTE switch subassembly. (Refer to Paragraph 3-14-2, Fig. 3-32)

4) Unscrew screw (3) and remove the ring roller adjust plate (4) and ring roller (5).

5) Remove the S threading ring (6).

Caution: Do not use the same washer twice.

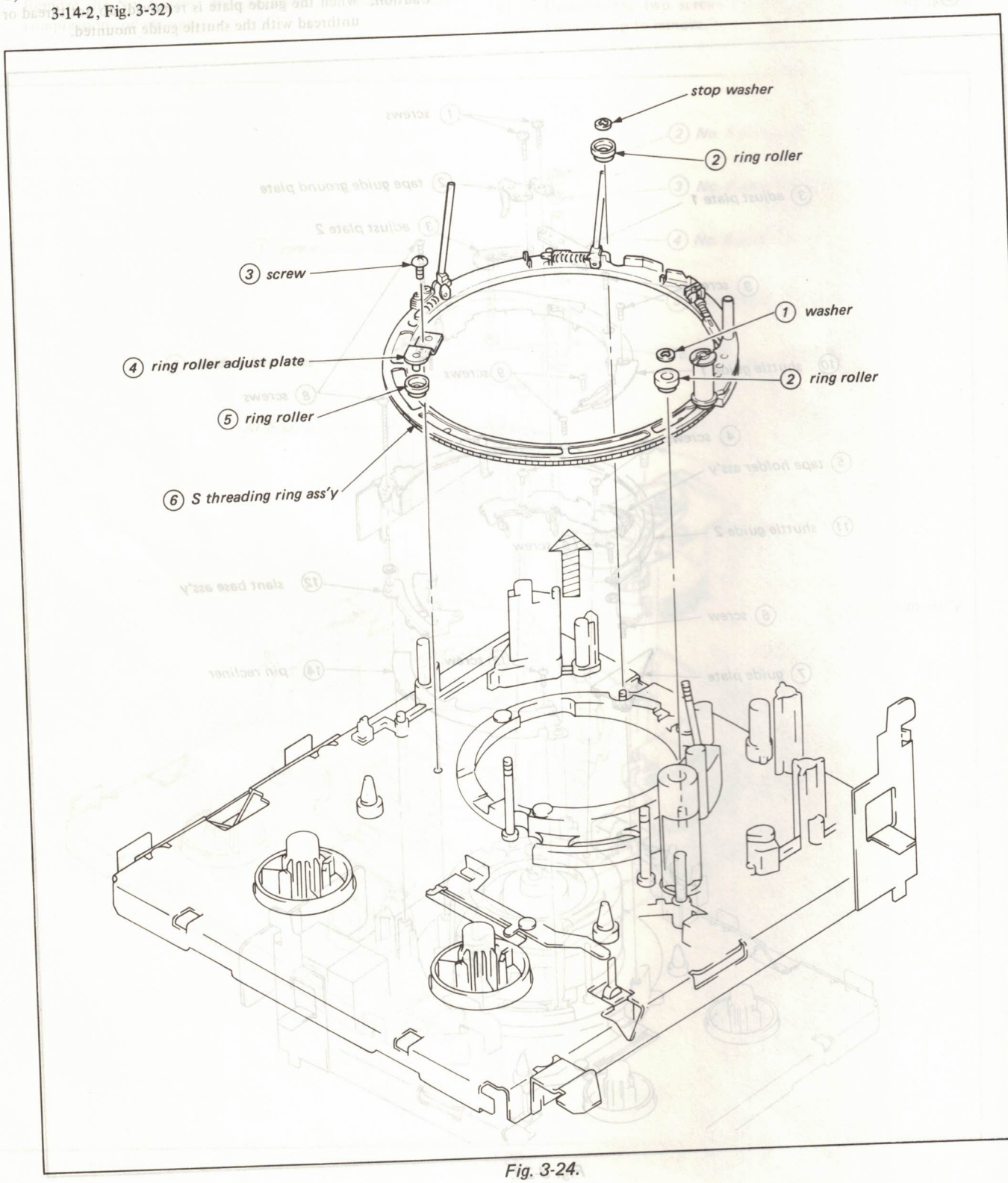


Fig. 3-24.

3-10-3. Checking Slider Stopper Mounting (Fig. 3-25)

1) Check that the drive gear is engaged.

2) Loosen screw (1), insert a spacer (t = 0.2) between the slider gear and slider stopper, then tighten screw (1) while pushing in the directions of arrows (A) and (B).

Caution: Make sure to push it in the direction (A) to eliminate any play. The slider stopper rotates in the direction of arrow (A) when screw (1) is tightened. Therefore, tighten the screw while holding it with a blade-tip screwdriver.

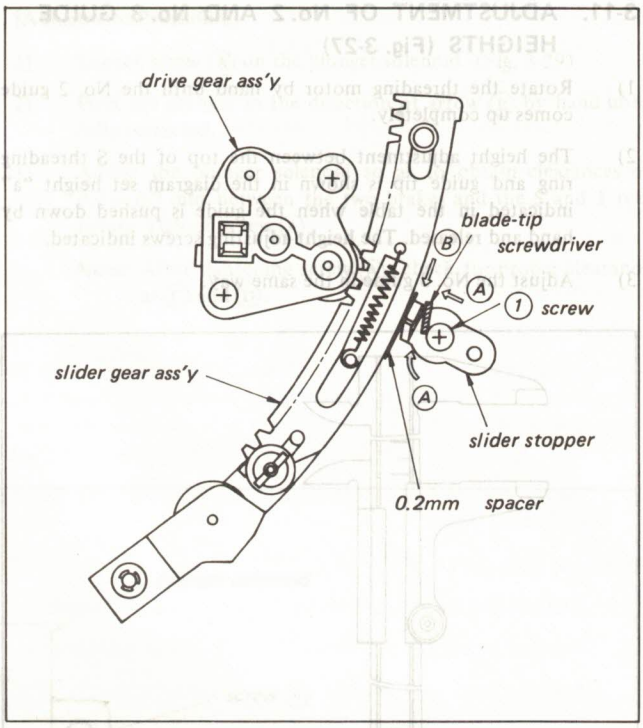


Fig. 3-25. Slider stopper mounting check

3-10-4. Replacement of S Threading Ring (Fig. 3-26)

1) Mount the S threading ring.

2) Insert a spacer (t = 0.2) and set the slider gear to the position where unthreading is complete.
(In the diagram, the slider stopper and slider gear come into contact at (A) through the spacer.)

3) Match up the notch on the S threading ring and the tab on the drive gear as shown at (B) in the diagram.

4) Engage the drive gear, S threading ring, and slider gear, and position the chassis.

5) The gap between the tab on the slider gear and the slider stopper at section (A) is about 0.5 mm when the S threading ring is rotated fully CCW toward of arrow (a). At the same time, verify that the chassis hole (ϕ3) at (C) and the hole (ϕ1.5) of the S threading ring match.

6) If the holes do not match exactly, adjust the engagement of the drive gear and S threading gear.

Note: After replacing and mounting, adjust the guide height according to Section 3-11. Also adjust the ACE assembly according to the section on "Tape Path Adjustment".

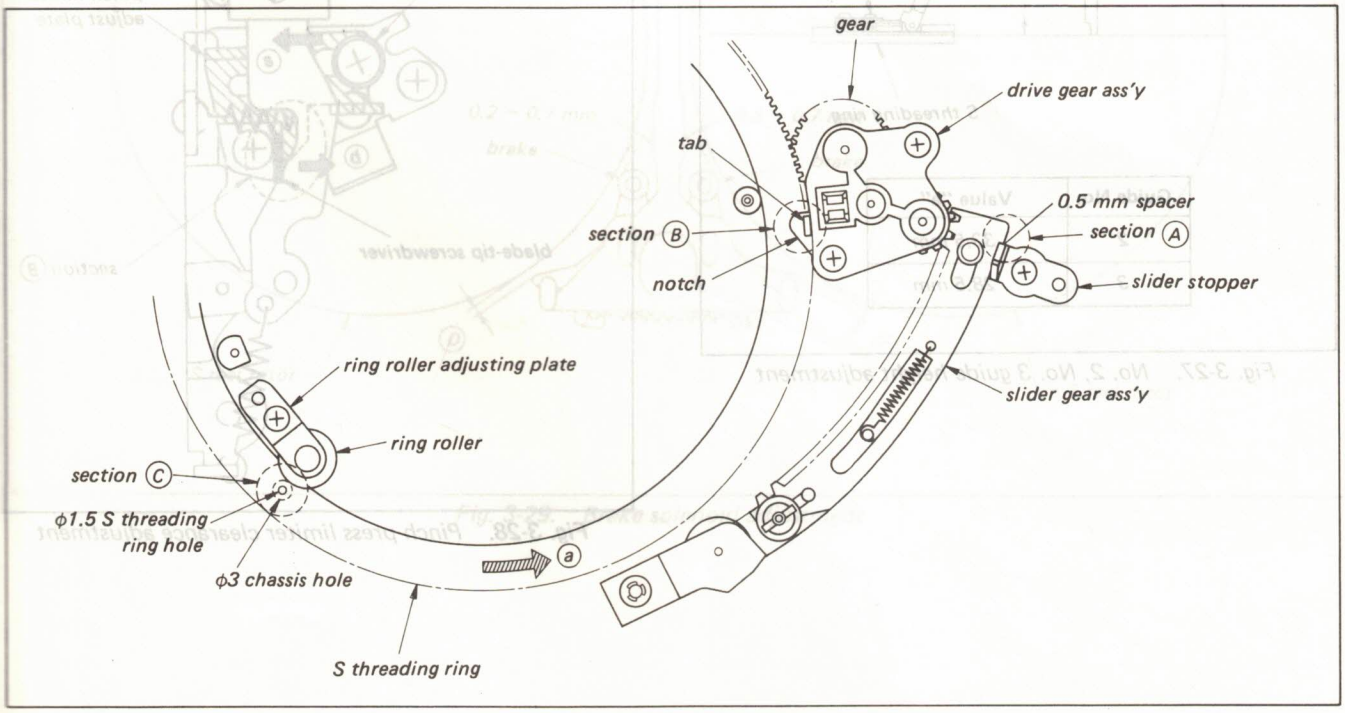


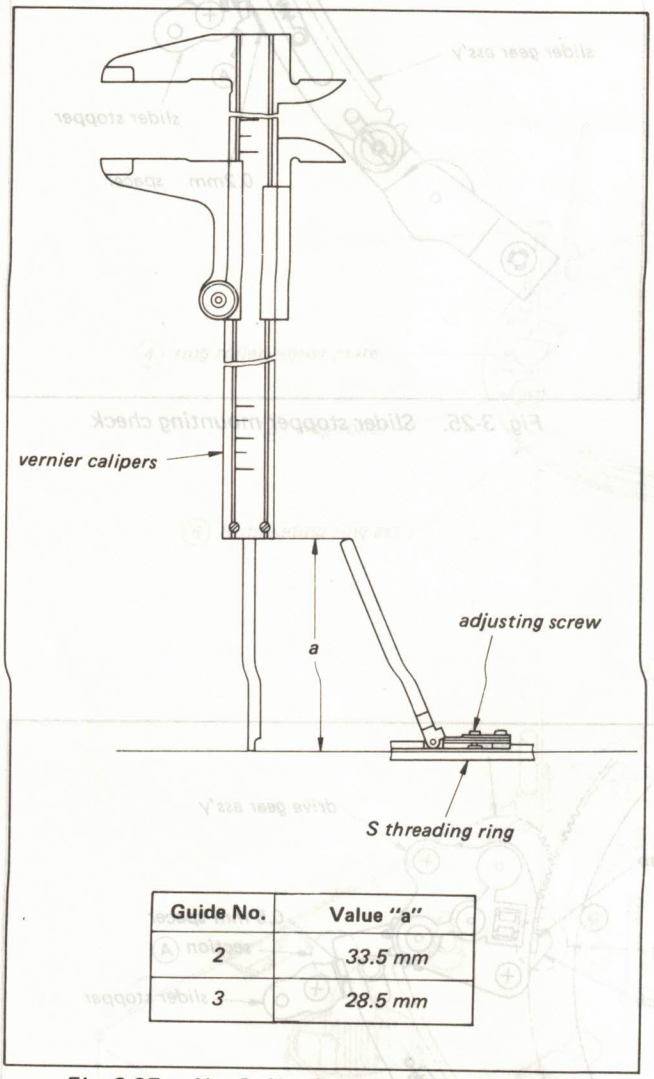
Fig. 3-26. Replacement of S threading ring

3-11. ADJUSTMENT OF No. 2 AND No. 3 GUIDE HEIGHTS (Fig. 3-27)

1) Rotate the threading motor by hand until the No. 2 guide comes up completely.

2) The height adjustment between the top of the S threading ring and guide tip is shown in the diagram set height "a" indicated in the table when the guide is pushed down by hand and released. The height adjusting screws indicated.

3) Adjust the No. 3 guide in the same way.



Guide No.	Value "a"
2	33.5 mm
3	28.5 mm

Fig. 3-27. No. 2, No. 3 guide height adjustment

3-12. CHECK AND ADJUSTMENT OF PINCH PRESS LIMITER CLEARANCE

[Check Procedure]

1) Set in the STOP mode without inserting a cassette.

2) Check that the clearance "t" of the pinch press limiter (Fig. 3-28) is 0.2 – 0.7 mm. If not, adjust as follows:

[Adjustment Procedure]

1) Loosen screw (A) in Fig. 3-28 with the pinch solenoid held in.

2) Move the pinch limiter adjust plate (shaded in the diagram) fully in the direction of arrow (a), so the clearance "t" at this time is 0.

3) Push the pinch limiter adjust plate in the direction of arrow (b) as shown at section (B) using a blade-tip screwdriver, until the clearance "t" is 0.2 – 0.7 mm.

4) Tighten screw (A) and lock it.

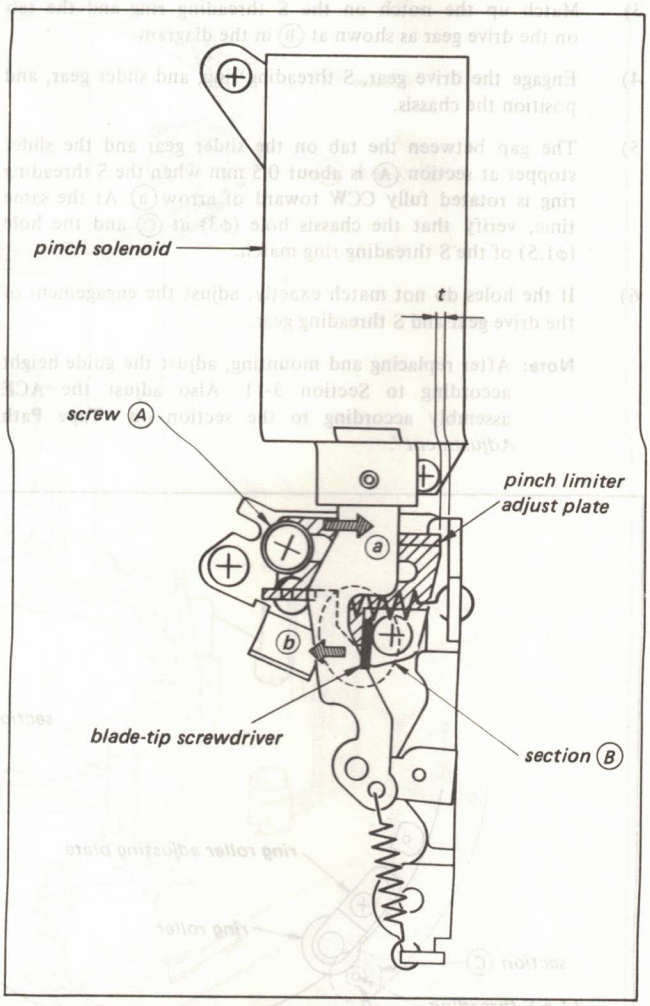


Fig. 3-28. Pinch press limiter clearance adjustment

3-13. BRAKE OPERATION CHECK AND BRAKE SOLENOID ADJUSTMENT

Tape slack occurs particularly when the tape diameter on the take-up side on both FF and REW is small, so recheck in these states.

[Check Procedure]

1) Rewind the tape and start forward feed.
2) Repeat FF → STOP several times and check that the tape does not slacken. If it does, adjust according to Adjustment Procedure, below.
3) Wind the tape to the end in fast forward.
4) Repeat REW → STOP several times and verify that the tape does not slacken. Adjust as follows if it does.

[Adjustment Procedure]

1) Loosen screw (A) on the plunger solenoid. (Fig. 3-29)
2) Push the plunger in the direction of arrow (B) by hand until fully retracted.
3) Adjust the plunger solenoid so as to obtain clearances of 0.2 – 0.7 mm between the two brakes and the S and T reel rotors. Tighten screw (A).

   Note: After tightening screw (A), check for proper clearance at (C) and (D).

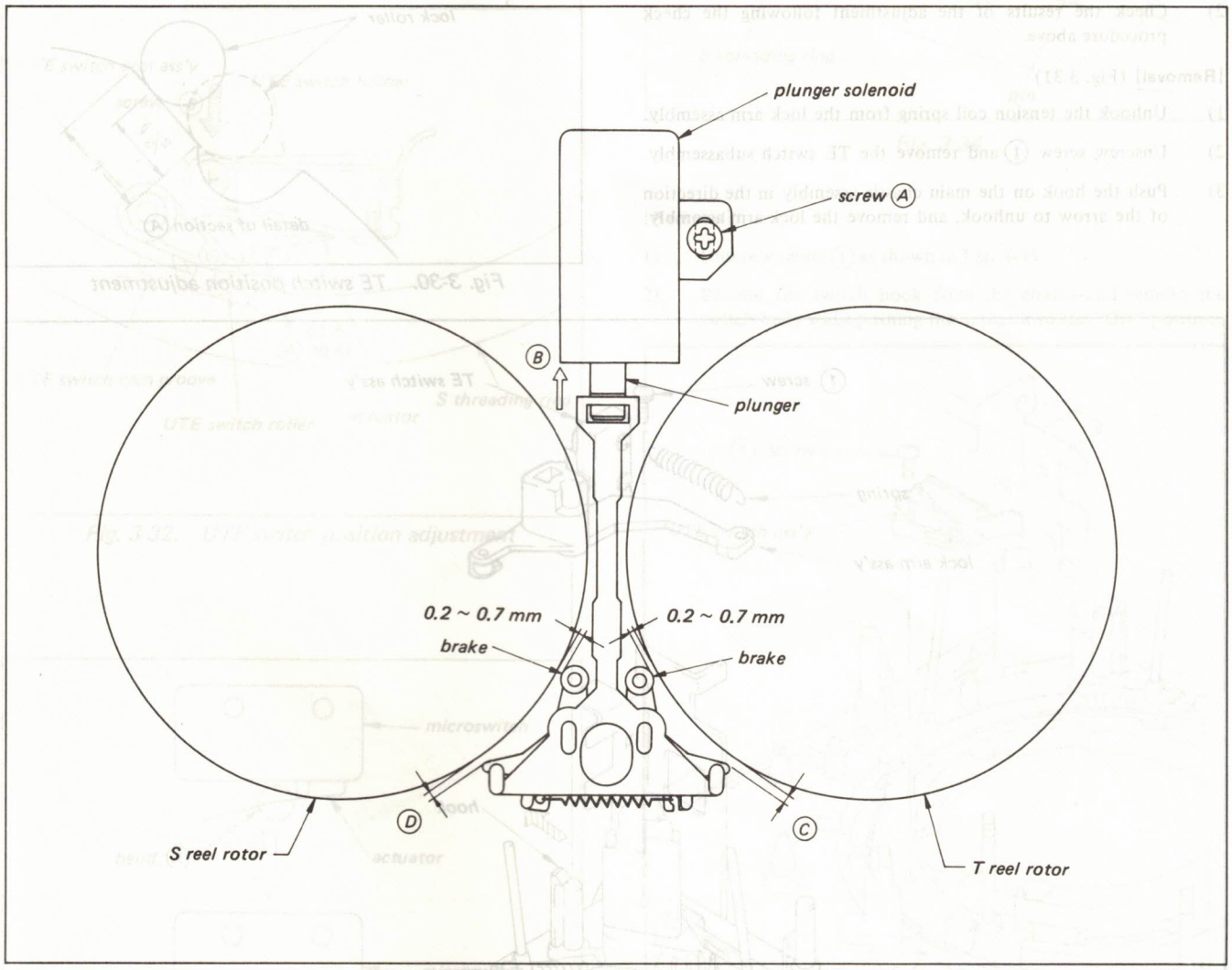


Fig. 3-29. Brake solenoid adjustment

3-14. CHECK AND ADJUSTMENT OF MICROSWITCH POSITION

3-14-1. Check and Adjustment of Threading End Switch (TE Switch) Position

[Check Procedure] (Fig. 3-30)

Rotate the S threading ring by hand and check that the TE switch turns on and off with a clicking noise while the lock roller is moving within the lower 2/3 of the straight portion ℓ of the recess (Ⓐ in Fig. 3-30) on the ring. If not, adjust as follows.

[Adjustment Procedure]

1) Bring the lock roller into the lower 2/3 of the "ℓ" range in the recess on the S threading ring. Move the TE switch in the direction of the arrow using a blade-tip screwdriver, until the switch trips (click noise), then tighten screw Ⓑ.

2) Check the results of the adjustment following the check procedure above.

[Removal] (Fig. 3-31)

1) Unhook the tension coil spring from the lock arm assembly.

2) Unscrew screw ① and remove the TE switch subassembly.

3) Push the hook on the main chassis assembly in the direction of the arrow to unhook, and remove the lock arm assembly.

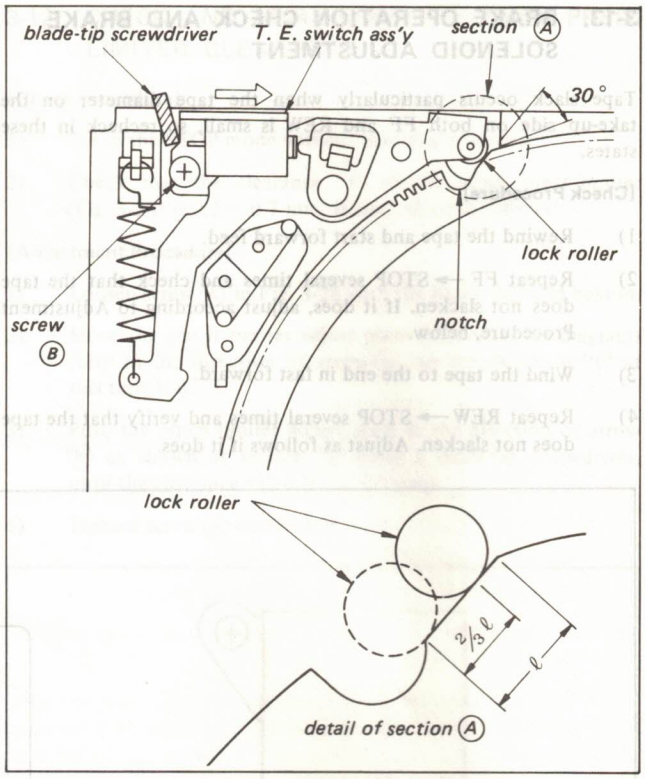


Fig. 3-30. TE switch position adjustment

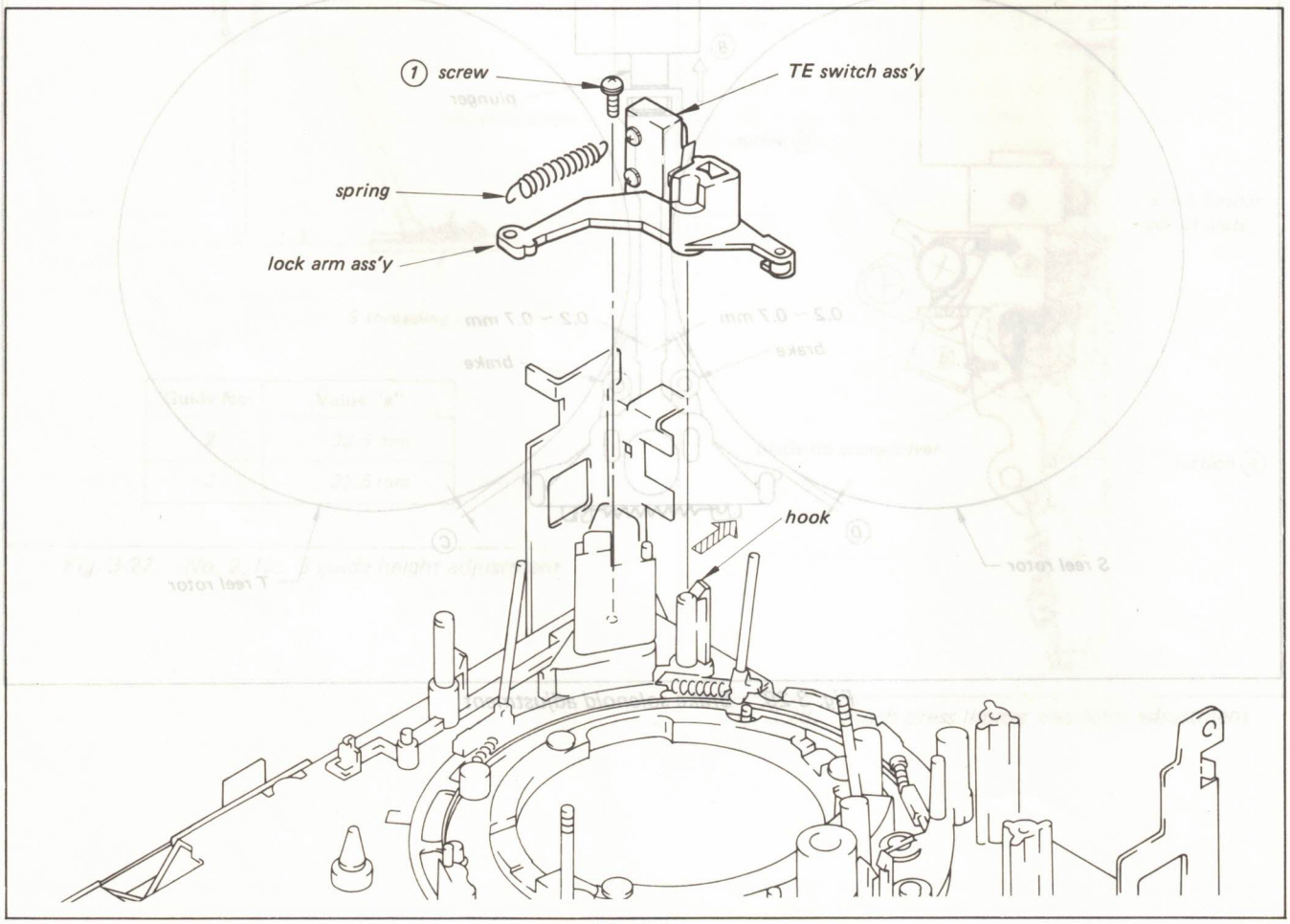


Fig. 3-31.

3-14-2. Check and Adjustment of Unthreading End Switch (UTE Switch) Position

[Check Procedure]

Rotate the S threading ring by hand. Verify that the switch trips when a pin of ϕ1.5 is inserted at section (A) in Fig. 3-32 after the UTE switch arm roller assembly has dropped into the UTE switch cam groove. Verify that the switch does not trip when a pin of ϕ0.6 is inserted.

[Adjustment Procedure]

1) If the switch does not trip when the ϕ1.5 pin is inserted, loosen small screw (B) and adjust by moving the roller in the direction of the arrow little by little.

2) Bend the switch actuator as shown in Fig. 3-33 if the switch turns on when a ϕ0.6 pin is inserted.

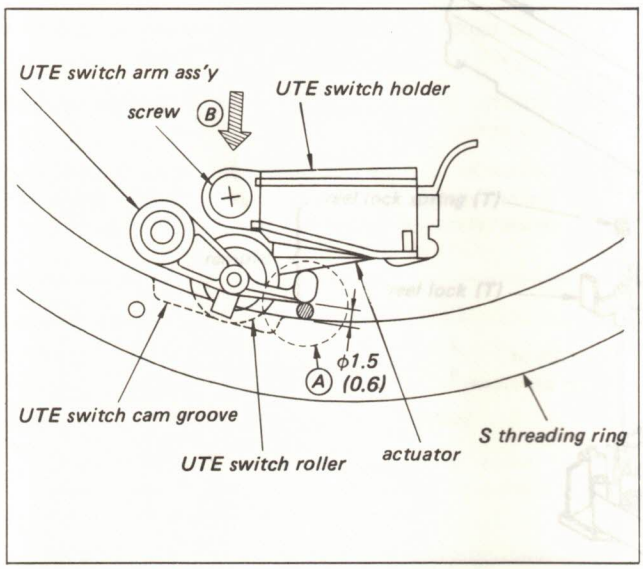


Fig. 3-32. UTE switch position adjustment

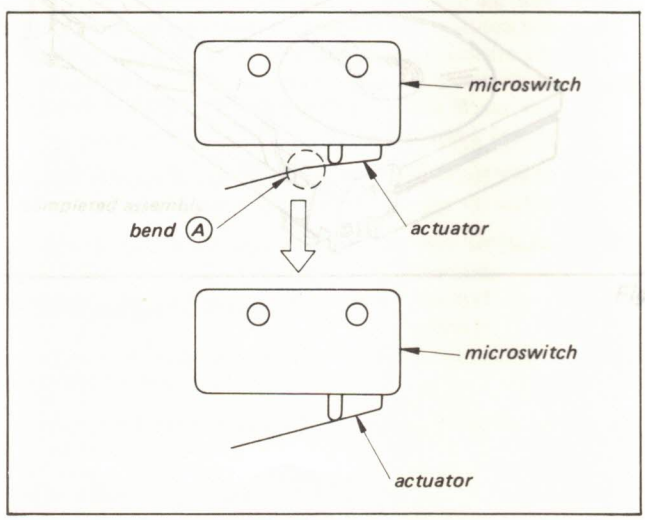


Fig. 3-33.

Caution: Insert the ϕ1.5 and 0.6 pins in the proper positions shown in Fig. 3-32. (If the pins are inserted too close to the UTE roller side as shown in Fig. 3-34, the clearance inside will be less than 1.5 mm, even though it is 1.5 mm at the entrance, because of the switch construction.)

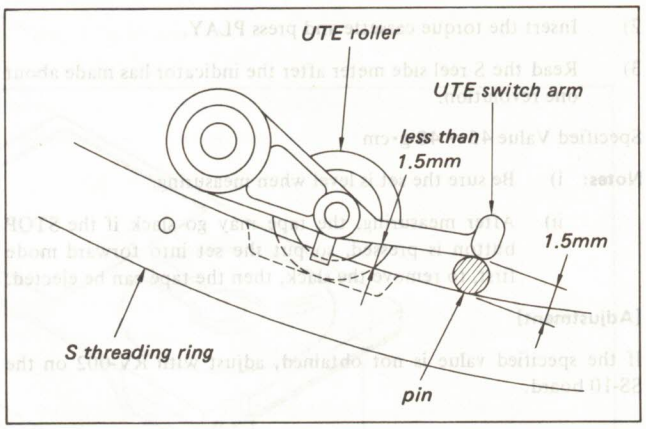


Fig. 3-34.

[Removal]

1) Unscrew screw (1) as shown in Fig. 3-35.

2) Release the switch hook from the chassis and remove the switch body while pushing the actuator to the "ON" position.

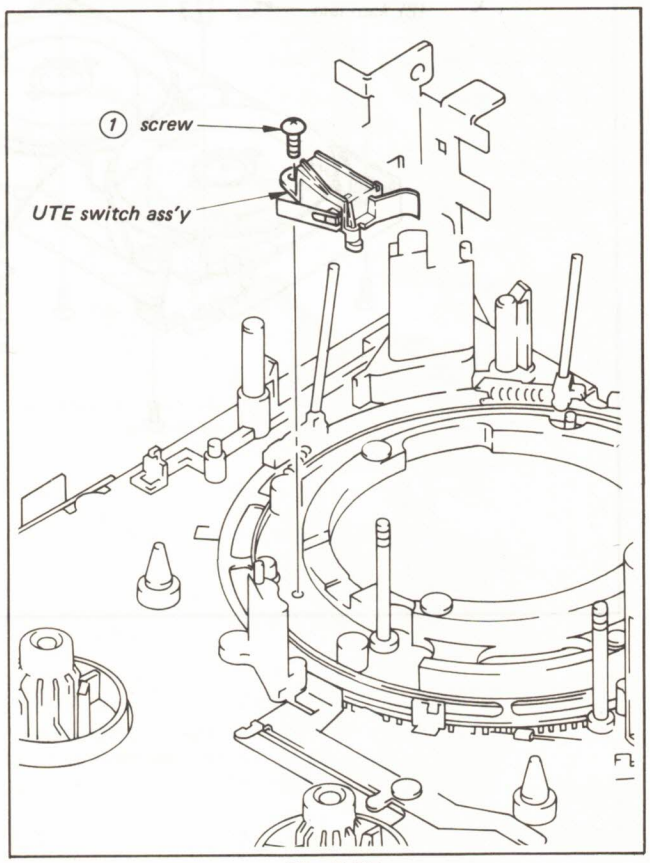


Fig. 3-35.

3-15. FORWARD/BACK TENSION MEASUREMENT

Perform this measurement using torque cassette SL-0003C according to the procedure below.

[Procedure]

1) Remove the upper panel so that the tape path is visible.

2) Insert the torque cassette and press PLAY.

3) Read the S reel side meter after the indicator has made about one revolution.

Specified Value 45 ~ 48 g·cm

Notes: i) Be sure the set is level when measuring.

ii) After measuring, the tape may go slack if the STOP button is pressed, so put the set into forward mode first, to remove the slack, then the tape can be ejected.

[Adjustment]

If the specified value is not obtained, adjust with RV-002 on the SS-10 board.

SECTION 4
TAPE PATH ADJUSTMENT

4-1. TRACKING ADJUSTMENT

This adjustment has significant effect on picture quality in each mode and tape interchangeability, so please perform it very carefully.

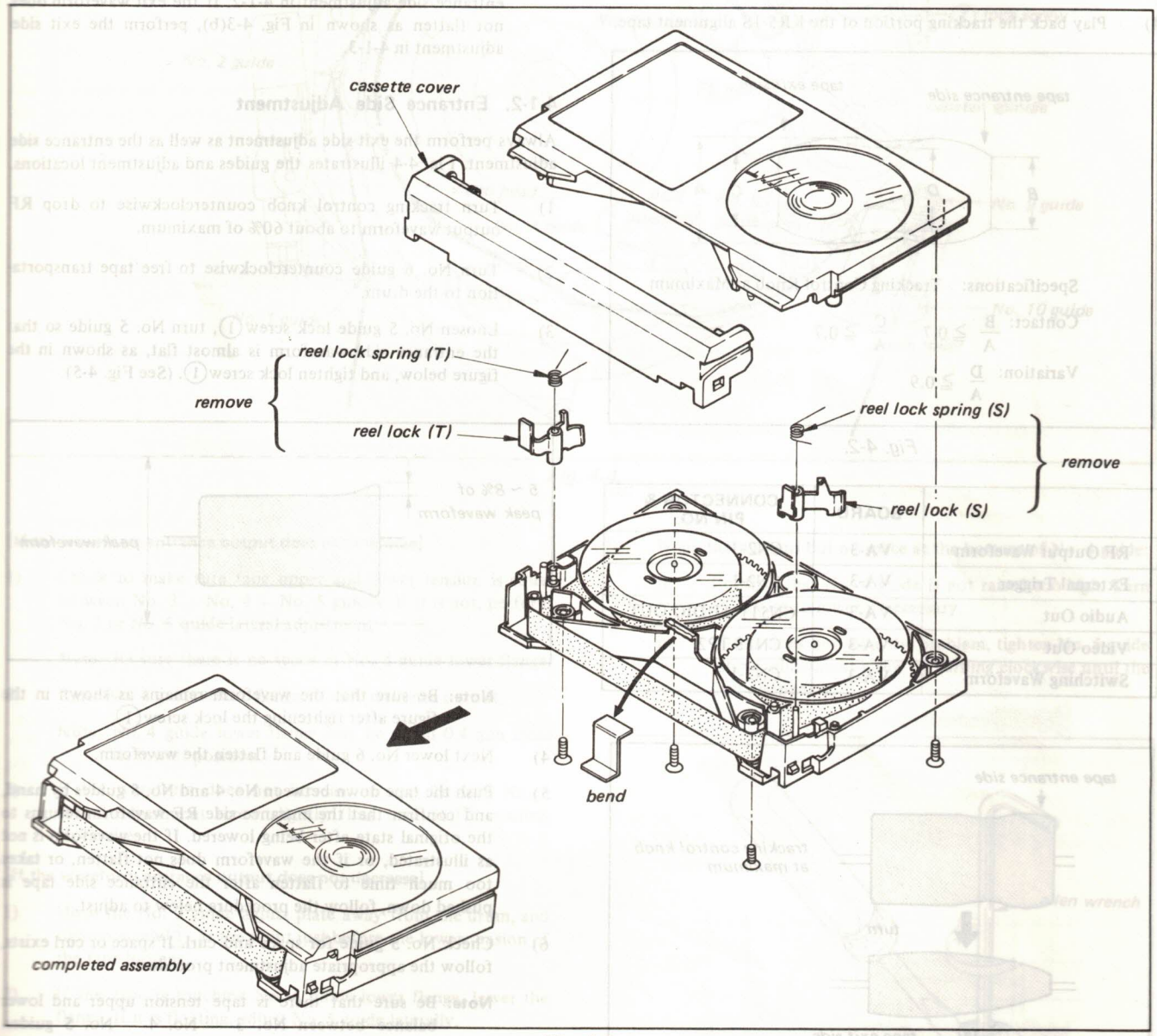


Fig. 4-1.

4-1-1. Preparation

1) Remove reel lock springs, reel locks and the cassette cover of alignment tape KR5-1S as shown in Fig. 4-1.

2) Clean the tape contact surfaces (tape guides, drum, capstan shaft, pinch roller, ACE FE head surfaces) with chamois dampened with methanol.

3) Oscilloscope connections: 1ch: CN2-3 pin (VA-3 board)
2ch: CN2-1 pin (VA-3 board)

4) Play back the tracking portion of the KR5-1S alignment tape.

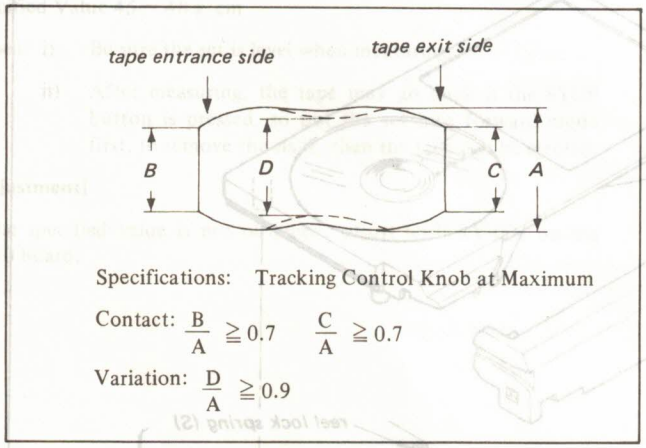


Fig. 4-2.

	BOARD	CONNECTOR & PIN NO.
RF Output Waveform	VA-3	CN2-3
External Trigger	VA-3	CN2-1
Audio Out	VA-3	CN511 AUDIO OUT
Video Out	VA-3	CN13 TP2
Switching Waveform	VA-3	CN2-1

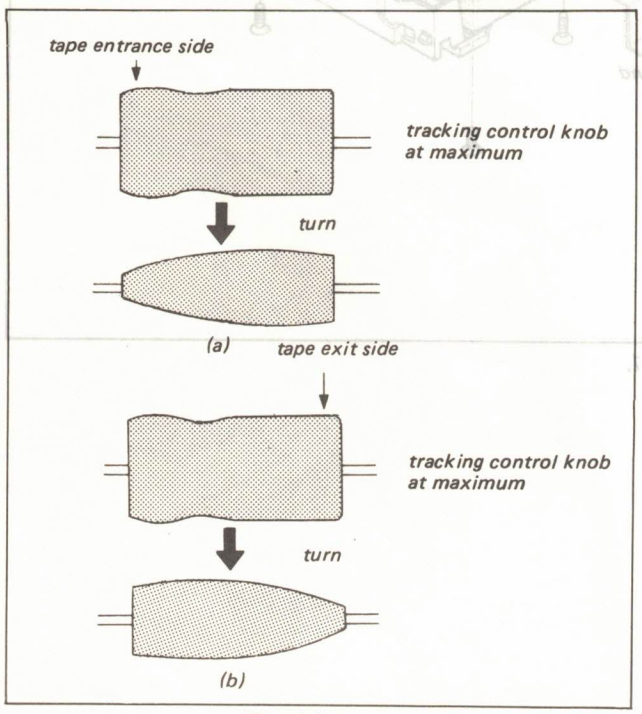


Fig. 4-3.

5) Confirm that the RF output waveform is flat, with maximum amplitude. (The waveform should increase and decrease, remaining flat, when the tracking control knob is turned back and forth.) Also, when the waveform is maximum, confirm that the RF output waveform variation and contact satisfy the specifications shown in Fig. 4-2. If they do not, follow the instructions in 6).

6) If the tracking control knob is turned and the entrance waveform does not flatten as shown in Fig. 4-3(a), perform the entrance side adjustment in 4-1-2. If the exit waveform does not flatten as shown in Fig. 4-3(b), perform the exit side adjustment in 4-1-3.

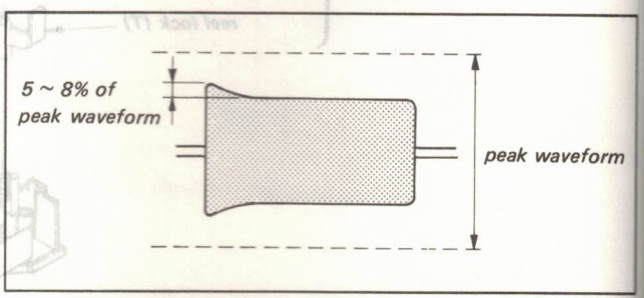
4-1-2. Entrance Side Adjustment

Always perform the exit side adjustment as well as the entrance side adjustment. Fig. 4-4 illustrates the guides and adjustment locations.

1) Turn tracking control knob counterclockwise to drop RF output waveform to about 60% of maximum.

2) Turn No. 6 guide counterclockwise to free tape transportation to the drum.

3) Loosen No. 5 guide lock screw ①, turn No. 5 guide so that the entrance side waveform is almost flat, as shown in the figure below, and tighten lock screw ①. (See Fig. 4-5)



Note: Be sure that the waveform remains as shown in the figure after tightening the lock screw ①.

4) Next lower No. 6 guide and flatten the waveform.

5) Push the tape down between No. 4 and No. 5 guides by hand, and confirm that the entrance side RF waveform returns to the original state after being lowered. If the waveform is not as illustrated, or if the waveform does not flatten, or takes too much time to flatten after the entrance side tape is pushed down, follow the procedure below to adjust.

6) Check No. 5 guide for space and curl. If space or curl exists, follow the appropriate adjustment procedure.

Note: Be sure that there is tape tension upper and lower balance between No. 3 – No. 4 – No. 5 guides. Perform No. 3 or No. 5 guide lateral adjustment if necessary.

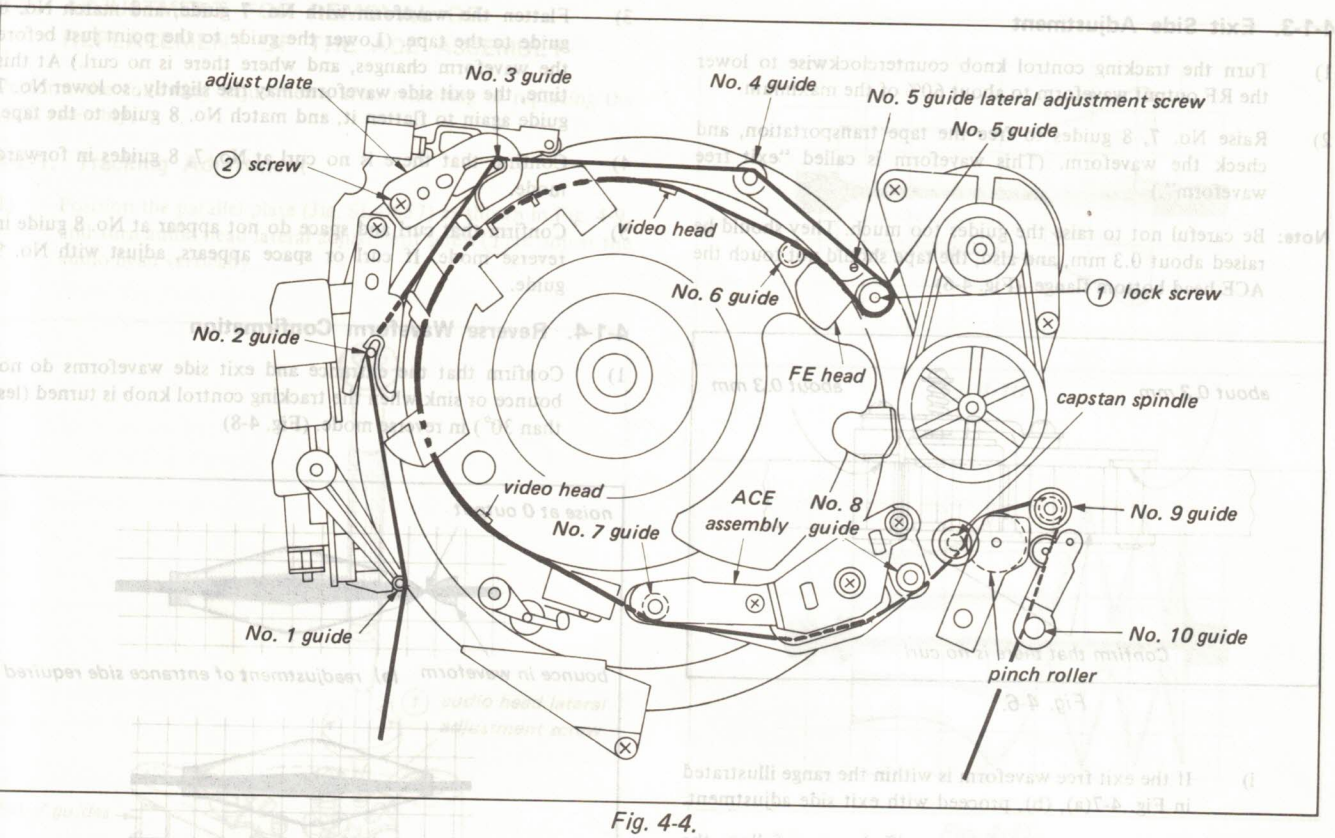


Fig. 4-4.

f the waveform entrance output does not increase]

Check to make sure tape upper and lower tension is equal between No. 3 – No. 4 – No. 5 guides. If it is not, perform No. 3 or No. 5 quide lateral adjustment.

Note: Be sure there is no space at No. 4 guide lower flange.

Raise No. 4 guide lower flange to raise entrance output.

Note: No. 4 guide lower flange may be raised 0.4 mm from its lowest position.

If the waveform does not increase in step 2), turn No. 5 lateral adjustment screw slightly (less than 360°) counter-clockwise.

the waveform entrance output does not decrease]

Move the No. 3 guide adjust plate away from the drum, and tighten screw (2) at the point just before the lower tension of the tape loosens.

If the tape is touching No. 4 guide lower flange, lower the flange. If it is floating, adjust No. 5 guide laterally.

there is space at no. 5 guide]

n No. 4 guide counterclockwise to raise the tape and remove the ce at No. 5 guide.

e: Be careful not to create a large space at the bottom of No. 4 guide.

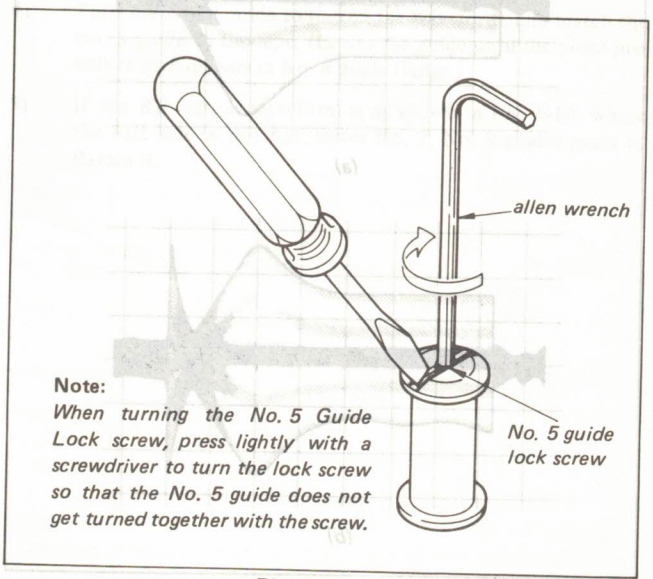
there is curl]

When there is a space at the bottom of No. 4 guide:
Lean the adjust plate of No. 3 guide toward the outside until the point just before the lower tape tension loosens.

2) When there is curl but no space at the bottom of No. 4 guide:

i) Confirm that No. 4 guide is not raised too high. Turn clockwise to lower if necessary.

ii) If this does not solve the problem, tighten No. 5 guide lateral adjustment screw by turning clockwise until the curl disappears.



Note:
When turning the No. 5 Guide Lock screw, press lightly with a screwdriver to turn the lock screw so that the No. 5 guide does not get turned together with the screw.

Fig. 4-5.

4-1-3. Exit Side Adjustment

1) Turn the tracking control knob counterclockwise to lower the RF output waveform to about 60% of the maximum.

2) Raise No. 7, 8 guides to free the tape transportation, and check the waveform. (This waveform is called "exit free waveform".)

Note: Be careful not to raise the guides too much. They should be raised about 0.3 mm, and also, the tape should not touch the ACE head bottom flange. (Fig. 4-6)

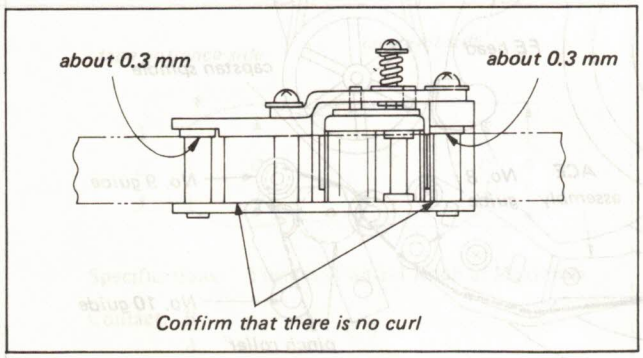


Fig. 4-6.

i) If the exit free waveform is within the range illustrated in Fig. 4-7(a), (b), proceed with exit side adjustment.

ii) If it is not within the specified range, follow the adjustment procedure in 4-3.

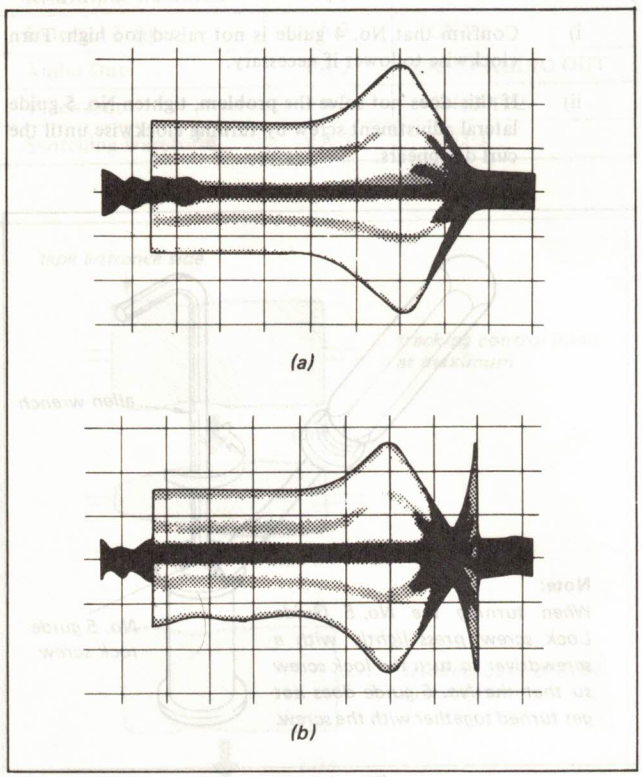


Fig. 4-7.

3) Flatten the waveform with No. 7 guide, and match No. 8 guide to the tape. (Lower the guide to the point just before the waveform changes, and where there is no curl.) At this time, the exit side waveform may rise slightly, so lower No. 7 guide again to flatten it, and match No. 8 guide to the tape.

4) Confirm that there is no curl at No. 7, 8 guides in forward mode.

5) Confirm that curl and space do not appear at No. 8 guide in reverse mode. If curl or space appears, adjust with No. 9 guide.

4-1-4. Reverse Waveform Confirmation

1) Confirm that the entrance and exit side waveforms do not bounce or sink when the tracking control knob is turned (less than 30°) in reverse mode. (Fig. 4-8)

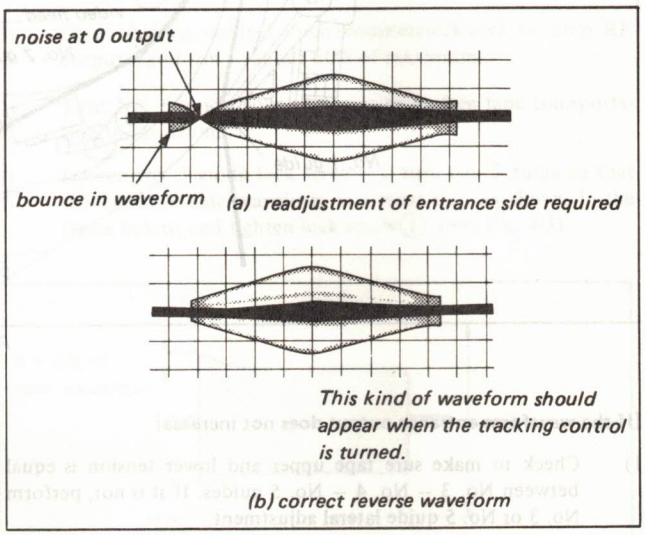

noise at 0 output
bounce in waveform
(a) readjustment of entrance side required
This kind of waveform should appear when the tracking control is turned.
(b) correct reverse waveform

Fig. 4-8.

2) If there is bounce or sinking in the entrance side waveform, re-adjust the entrance side in forward mode, and if there is bounce or sinking in the exit side waveform, re-adjust the exit side.

3) Confirm the waveform in reverse mode again.

Note: When re-adjusting, be sure to return the tracking control knob to the center position.

4-2. ADJUSTMENT FOR REMOVAL OR REPLACEMENT OF THE ACE ASSEMBLY

Perform the following adjustments after removing or replacing the ACE assembly.

4-2-1. Tracking Adjustment

1) Position the parallel plate (Jig, SL-0657) as shown in Fig. 4-9, and turn audio head lateral adjustment screw (1) to adjust the audio head vertically.

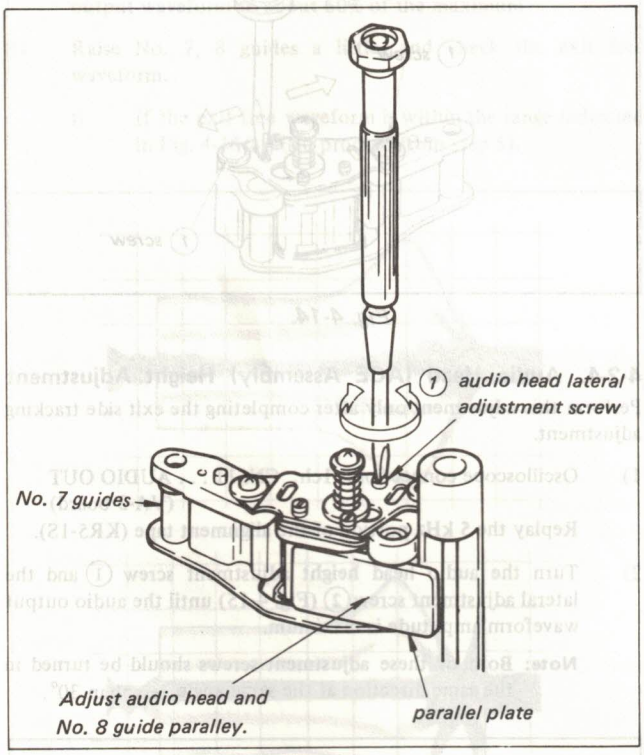


Fig. 4-9.

2) Turn the tracking control knob counterclockwise to lower the RF output waveform to about 60% of the maximum.

3) Play back the tracking portion of the alignment tape (KR5-1S), raise No. 7, 8 guides about 0.3 mm, and check the exit free waveform of the RF output waveform.

Note: Be sure that the tape does not touch the bottom flange of the ACE assembly.

i) If the waveform is within the range illustrated in Fig. 4-7(a), (b), proceed with the adjustment.

ii) If the exit free waveform appears as shown in Fig. 4-10, turn the ACE lateral adjustment screw clockwise until the waveform is within the range illustrated in Fig. 4-7(a), (b).

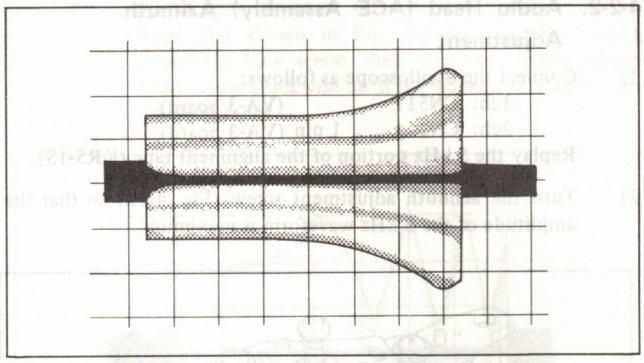


Fig. 4-10.

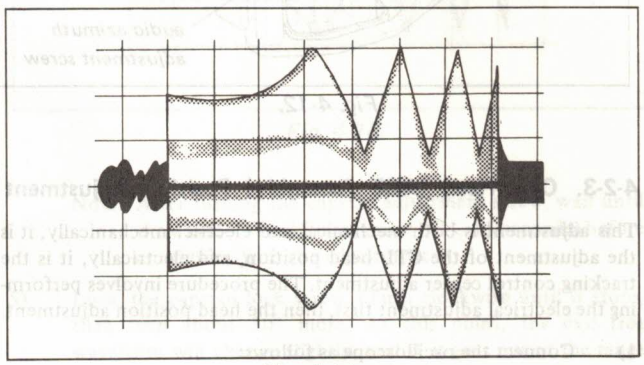


Fig. 4-11.

iii) If the exit free waveform appears as shown in Fig. 4-11, turn the ACE lateral adjustment screw couter-clockwise to obtain the waveform shown in Fig. 4-10, then turn clockwise again until the waveform is within the range shown in Fig. 4-7.

Note: The 3 audio head adjustment screws must be turned clockwise to adjust.

4) Turn the No. 7 guide to flatten the waveform, and match the No. 8 guide to the tape. (Lower the guide until the point just before curl appears at No. 8 guide flange.)

5) If the RF output waveform is as shown in Fig. 4-10, where the exit side is not flat, lower No. 7, No. 8 guides again to flatten it.

4-2-2. Audio Head (ACE Assembly) Azimuth Adjustment

1) Connect the oscilloscope as follows:
   1ch: CN511 (VA-3 board)
   2ch: CN2 . . . 1 pin (VA-3 board)
   Replay the 5 kHz portion of the alignment tape (KR5-1S).

2) Turn the azimuth adjustment screw (Fig. 4-12) so that the amplitude of the 5 kHz waveform is maximum.

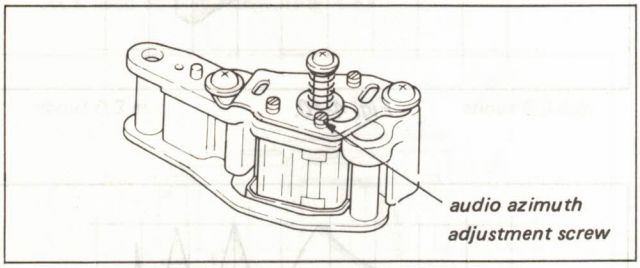


Fig. 4-12.

4-2-3. CTL Head (ACE Assembly) Position Adjustment

This adjustment is both mechanical and electric: mechanically, it is the adjustment of the CTL head position, and electrically, it is the tracking control center adjustment. The procedure involves performing the electrical adjustment first, then the head position adjustment.

1) Connect the oscilloscope as follows:

   1ch: CN2 . . . 3 pin (VA-3 board)
   2ch: CN511 . . AUDIO OUT (VA-3 board)
   External trigger: CN2 . . . 1 pin (VA-3 board)

2) Play back the tracking portion of the alignment tape (KR5-1S).

3) Turn the tracking control knob back and forth, and confirm that the output waveform level is maximum at the center click position, and that the 0 level of the audio signal is at the point where the RF output waveform Bch waveform appears, as shown in Fig. 4-13.
   If adjustment is necessary, proceed as follows.

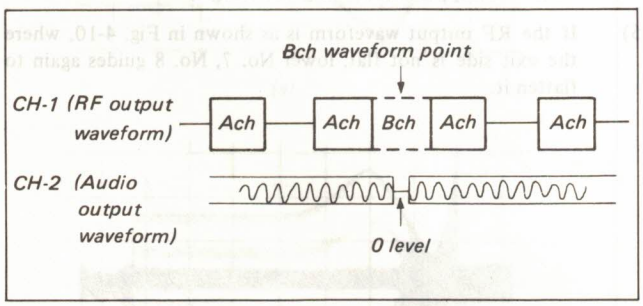


Fig. 4-13.

4) Tracking Control Center Adjustment

5) CTL Head Position Adjustment
   Set the tracking control knob at the center click position and loosen the two ACE assembly position adjustment screws ①. As shown in Fig. 4-14, slide the ACE assembly with a screwdriver until it is in the position shown in Fig. 4-13 and the RF output waveform is maximum. Tighten the screws when this position is obtained.

6) Replay the βII color bars of the alignment tape and check the picture quality.

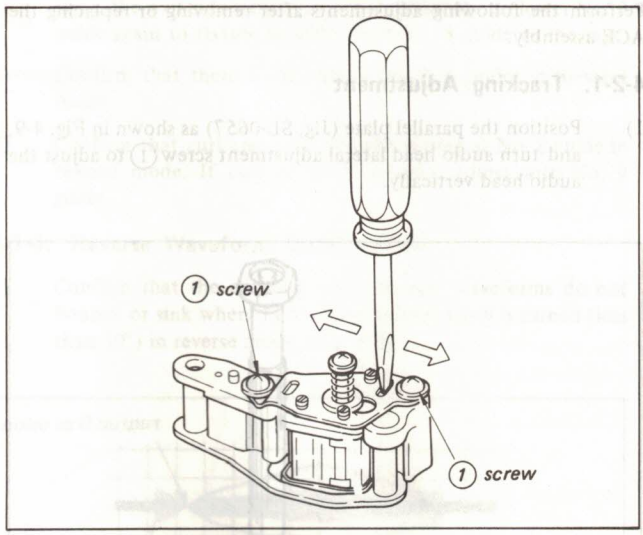


Fig. 4-14.

4-2-4. Audio Head (ACE Assembly) Height Adjustment

Perform this adjustment only after completing the exit side tracking adjustment.

1) Oscilloscope connection: 1ch: CN511 . . . AUDIO OUT (VA-3 board)
   Replay the 5 kHz portion of the alignment tape (KR5-1S).

2) Turn the audio head height adjustment screw ① and the lateral adjustment screw ② (Fig. 4-15) until the audio output waveform amplitude is maximum.

   Note: Both of these adjustment screws should be turned in the same direction at the same angle, less than 30°.

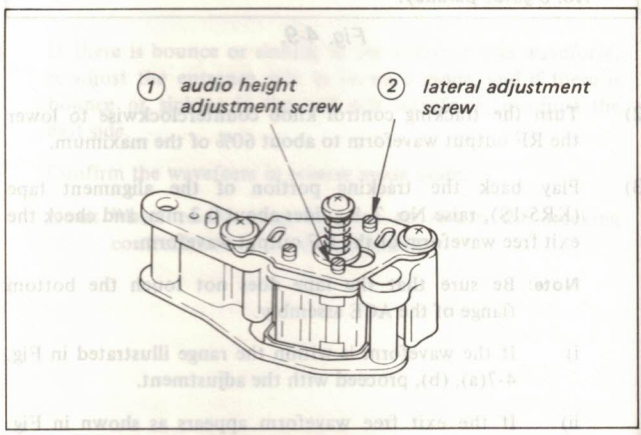


Fig. 4-15.

4-3. ADJUSTMENT FOR REMOVAL OR REPLACEMENT OF THE CAPSTAN MOTOR

1) Perform the vertical adjustment of the capstan shaft according to 3-4, Replacement and Adjustment of Capstan Motor.

2) Play back the tracking portion of the alignment tape (KR5-1S). Connect the oscilloscope as follows:

1ch: CN2 . . 3 pin (VA-3 board)
2ch: CN2 . . 1 pin (VA-3 board)

3) Turn the tracking control knob clockwise to lower the RF output waveform to about 60% of the maximum.

4) Raise No. 7, 8 guides a little, and check the exit free waveform.

i) If the exit free waveform is within the range indicated in Fig. 4-16(a), (b), proceed from step 5).

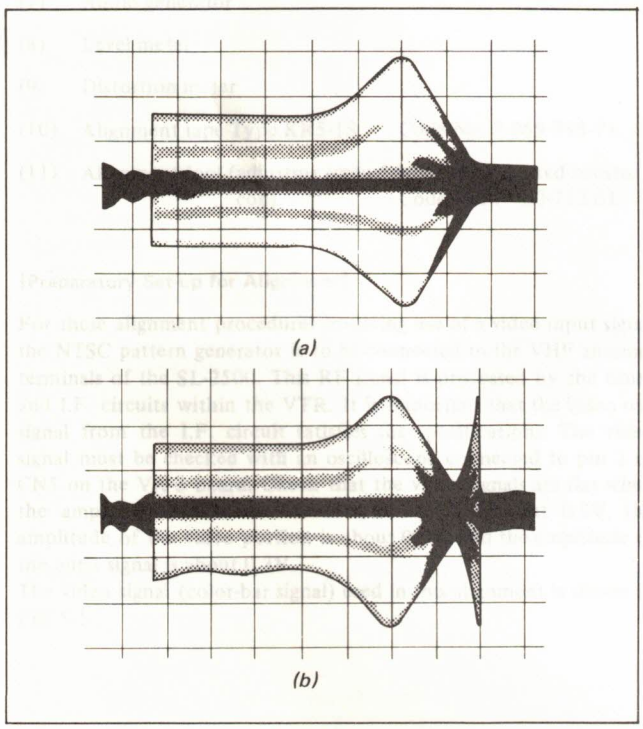


Fig. 4-16.

ii) If the peak of the exit free waveform is smaller than that illustrated in Fig. 4-16(a) (e.g. Fig. 4-17), loosen the lock screw, then turn the capstan adjustment screw until the waveform is within the specified range.

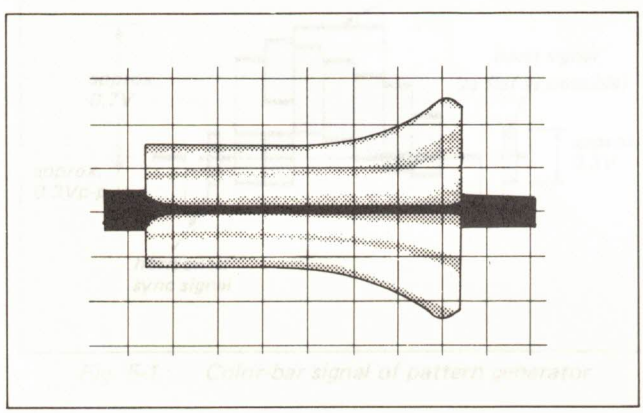


Fig. 4-17.

iii) If the peak shape of the exit free waveform differs from that shown in Fig. 4-16(b) (e.g. Fig. 4-18), loosen the lock screw, then turn the capstan adjustment screw clockwise until the waveform is within the specified range.

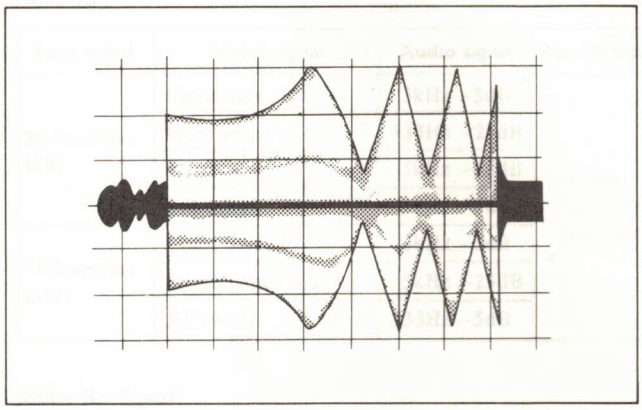


Fig. 4-18.

Note: After turning the capstan adjustment screw, wait until the waveform stabilizes (about 10 – 15 seconds) before continuing with the adjustment.

5) Lock the capstan lock screw. (Turn clockwise until it stops, then turn about 30° more. At this point, the exit free waveform will change slightly, and if it goes out of the range shown in Fig. 4-16(a), (b) return to step 4) and re-adjust.

6) Flatten the waveform with No. 7 guide, and match No. 8 guide to the tape. If the exit waveform rises, flatten it again with No. 7 guide and match No. 8 guide to the tape again.

7) Confirm and adjust according to 4-1-3, exit side adjustment procedure items 4), 5).

SECTION 5
ELECTRICAL ALIGNMENT

This section provides all necessary information and instructions for complete alignment of the electronic circuits in this machine.

EQUIPMENT REQUIRED

(1) Color TV receiver

(2) Oscilloscope Dual-trace, Bandwidth more than 15 MHz with delay mode

(3) Frequency counter (more than four digits)

(4) NTSC pattern generator

(5) Digital voltmeter

(6) VOM (20 kΩ/V)

(7) Audio generator

(8) Level meter

(9) Distortion meter

(10) Alignment tape Type KR5-1S Code No. 8-969-995-71

(11) Alignment tool (adjusting screwdriver for semi-fixed resistor coil) Code No. 7-700-733-01

[Preparatory Set-up for Alignment]

For these alignment procedures involving use of a video input signal the NTSC pattern generator is to be connected to the VHF antenna terminals of the SL-2500. This RF signal is processed by the tuner and I.F. circuits within the VTR. It is important that the video out signal from the I.F. circuit satisfies the specifications. The video signal must be checked with an oscilloscope connected to pin 2 of CN5 on the VA-3 board. Check that the video signals are flat when the amplitude of the horizontal sync signal is about 0.3V, the amplitude of the video portion is about 0.7V, and the amplitude of the burst signal is about 0.3V.
The video signal (color-bar signal) used in this alignment is shown in Fig. 5-1.

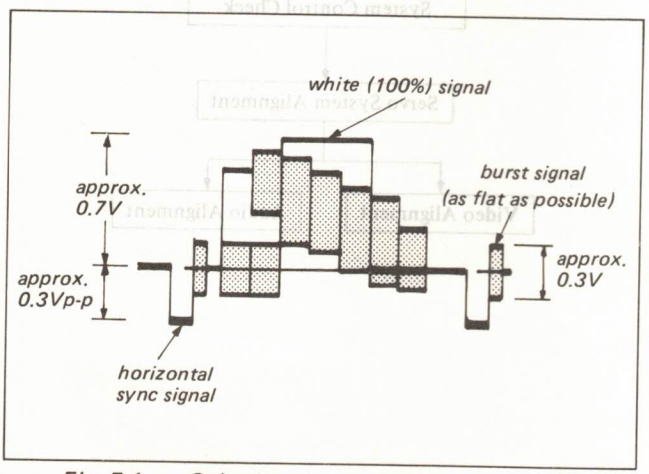


Fig. 5-1. Color-bar signal of pattern generator

[Alignment Tape]

KR5-1S

Tape speed	Video signal	Audio signal	Playing time
20.0mm/sec. (β II)	Color bars	3kHz –5dB	4 min. for each segment
	Monoscope	333Hz –25dB	
	RF sweep	5kHz –25dB	
	Tracking	1kHz –5dB	
13.3mm/sec. (β III)	Color bars	3kHz –5dB	
	Monoscope	5kHz –25dB	
	RF sweep	333Hz –5dB	

[Color Bar Signal]

The 75% color bar signal recorded on the alignment tape is shown in Fig. 5-2.

Note: Measure at TP2 on the VA-3 board. (75Ω terminate)

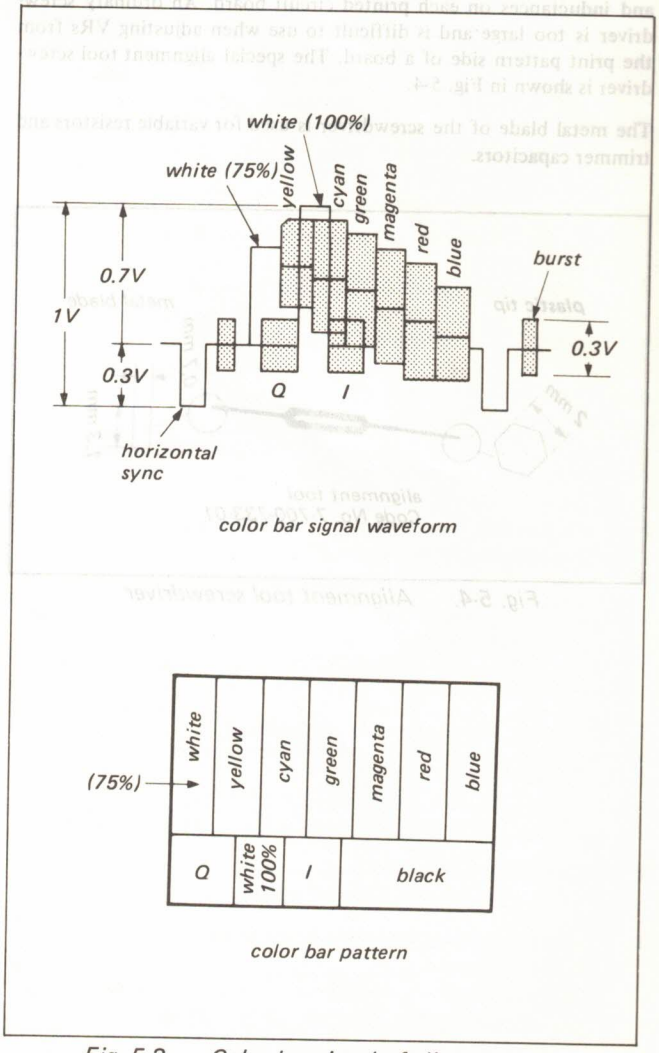


Fig. 5-2. Color-bar signal of alignment tape

[75Ω Terminating Method]

To terminate the video output terminal (TP2 on the VA-3 board), follow the steps shown in Fig. 5-3.

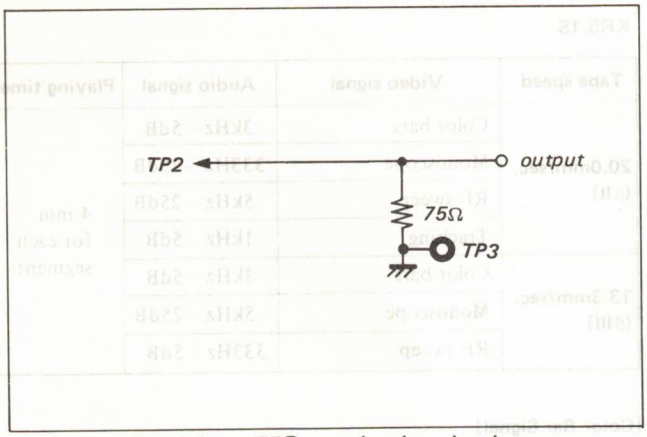


Fig. 5-3. 75Ω terminating circuit

[VR Alignment Tool Screwdriver]

Use the tool screwdriver supplied for alignment of semi-fixed VRs and inductances on each printed circuit board. An ordinary screwdriver is too large and is difficult to use when adjusting VRs from the print pattern side of a board. The special alignment tool screwdriver is shown in Fig. 5-4.

The metal blade of the screwdriver is used for variable resistors and trimmer capacitors.

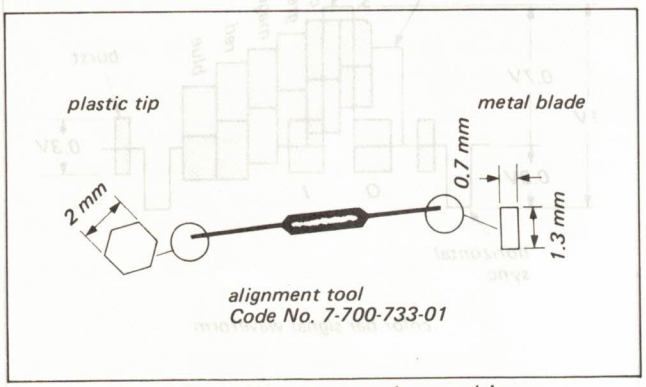


Fig. 5-4. Alignment tool screwdriver

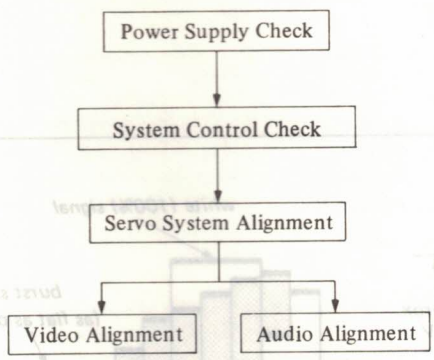
[Required Levels and Impedances of Input and Output]

Inputs and outputs

Video input:	Phono jack . . . . . 1 1 Vp-p ± 0.5 Vp-p, 75 ohms, unbalanced, sync negative
Video output:	Phono jack . . . . . 1 1 Vp-p ± 0.5 Vp-p, 75 ohms, unbalanced, sync negative
Audio input:	Minijack . . . . . 1 −10 dBs, (0.44 Vrms) (0 dBs = 0.775 Vrms) 47 kilohms
Audio output:	Minijack . . . . . 1 −5 dBs (0.4 Vrms, at 400 Hz, 100 kilohms load) Less than 600 ohms
Camera connector:	14 pin K-type connector Video in: 1 Vp-p ± 0.5 Vp-p 75 ohms, unbalanced, sync negative Video out: 1 Vp-p ± 0.5 Vp-p 75 ohms, unbalanced, sync negative Audio in: −20 dBs Audio out: −5 dBs (at load impedance 100 kilohms) less than 10 kilohms Power supply output: 12 Vdc
Microphone input:	Minijack . . . . . 1 −60 dBs, for low-impedance microphone

[Alignment Sequence]

The alignment should be performed following the sequence below.



5-1. POWER SUPPLY CHECK (SS-10 Board)

Measure in E-E mode (power supply switch ON).

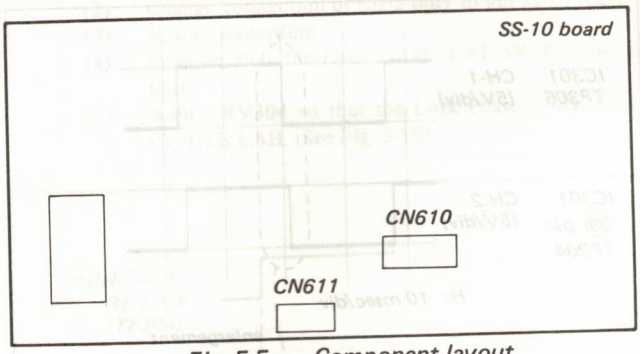


Fig. 5-5. Component layout

1. Unswitched 12V Check
   Pin 2 of CN611 shall be 12.6 ± 0.9V.
2. Switched 12V Check
   Pin 1 of CN611 shall be 12.6 ± 0.2V.
3. REG 9V Check
   Pin 4 of CN610 shall be 9.0V ± 0.2V.
4. REG 5V Check
   Pin 2 of IC610 shall be 5V ± 0.35V.

5-2. SYSTEM CONTROL CHECK (SS-10 Board)

1. **Clock Frequency Check**
   Mode: E-E
   Signal: None
   Frequency counter: Pin 10 of IC605
   Check: Within 3.9 MHz ± 0.1 MHz

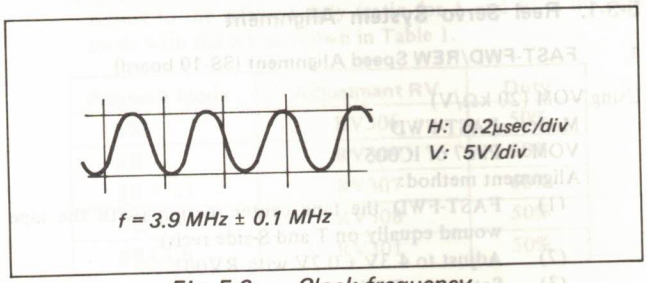


Fig. 5-6. Clock frequency

5-3. SERVO SYSTEM ALIGNMENT

Alignment Sequence

1. Reel servo system alignment
2. Drum servo system alignment
3. Capstan servo system alignment
4. Swing search servo system alignment

5-3-1. Reel Servo System Alignment

1. FAST-FWD/REW Speed Alignment (SS-10 board)

Using VOM (20 kΩ/V)
Mode: FAST-FWD
VOM: Pin 7 of IC005
Alignment method:
(1) FAST-FWD the tape center section (with the tape wound equally on T and S-side reels)
(2) Adjust to 4.3V ± 0.2V with RV001.
(3) Set up the REW mode at the tape center section.
(4) Check that VOM shows 4.3V ± 0.5V.

Using frequency counter
Mode: FAST-FWD
Frequency counter: D002 anode (TP002)
Alignment method:
(1) FAST-FWD the tape center section (with the tape wound equally on T and S-side reels)
(2) Adjust to 380 Hz ± 30 Hz with RV001.
(3) Connect the frequency counter to the anode of D001 (TP001).
(4) Set up the REW mode at the tape center section.
(5) Check that the frequency is 380 Hz ± 50 Hz.

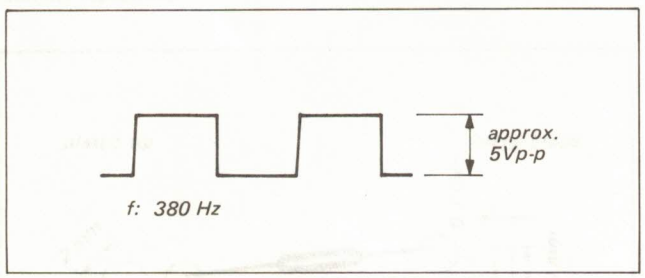


Fig. 5-7. Alignment of FAST-FWD/REW speed

2. FWD Back Tension Alignment (SS-10 board)
See "Mechanical Adjustment"

5-3-2. Drum Servo System Alignment

1. Voltage Check
(1) Pin 30 of IC301 shall be 5.6 ± 0.3V
(2) Pin 10 of IC301 shall be 3.5 ± 0.2V or 5 ± 0.2V

2. Clock Check
(1) Pin 28 of IC301 shall be above 0.4 Vp-p

3. Drum Free Speed Adjustment (SS-10 board)
Mode: Playback
Signal: Alignment tape βII color bar, or monoscope
Oscilloscope: CH-1 Pin 13 of IC301 (TP306)
CH-2 Pin 39 of IC301 (TP304)
Alignment method:
Adjust to 547 μsec ± 10 μsec with RV302 (See Fig. 5-8)

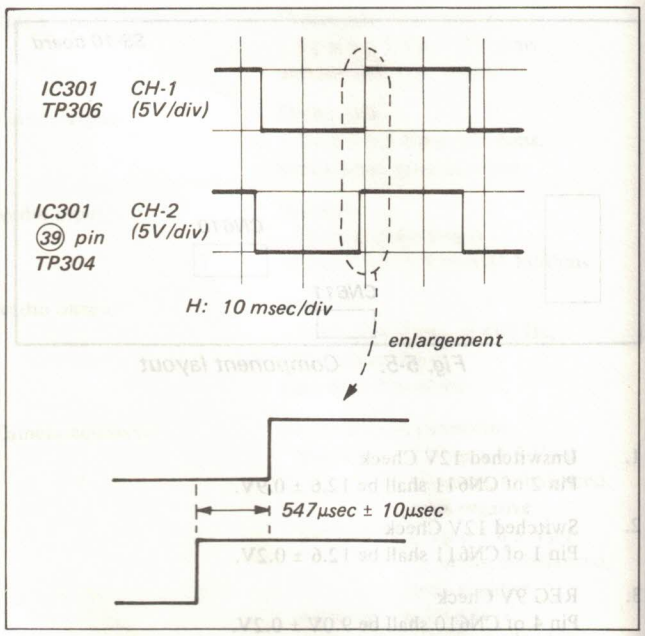


Fig. 5-8. Drum free speed adjustment

4. RF Switching Position Adjustment (SS-10 board)
Mode: Playback
Signal: Alignment tape βII color bar or monoscope
Oscilloscope: CH-1 TP304 (pin 39 of IC301)
CH-2 Pin 40 of IC301

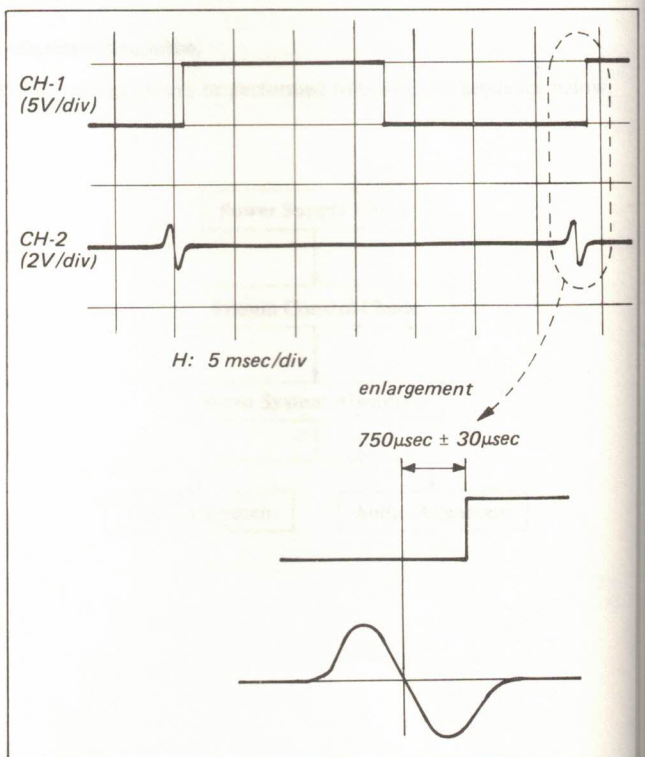


Fig. 5-9. RF switching position adjustment (1)

Adjustment method:

(1) Adjust to 750 μsec ± 30 μsec with RV301. (See Fig. 5-9)

(2) Change connection of CH-2 only to pin 32 of IC301.

(3) Mode: Recording

(4) Confirm that the Lock Phase of RF SW P (B_{CH}) is 6.5H.

(5) Adjust RV304 so that the Lock Phase of RF SW P (A_{CH}) is 6.5H. (See Fig. 5-10)

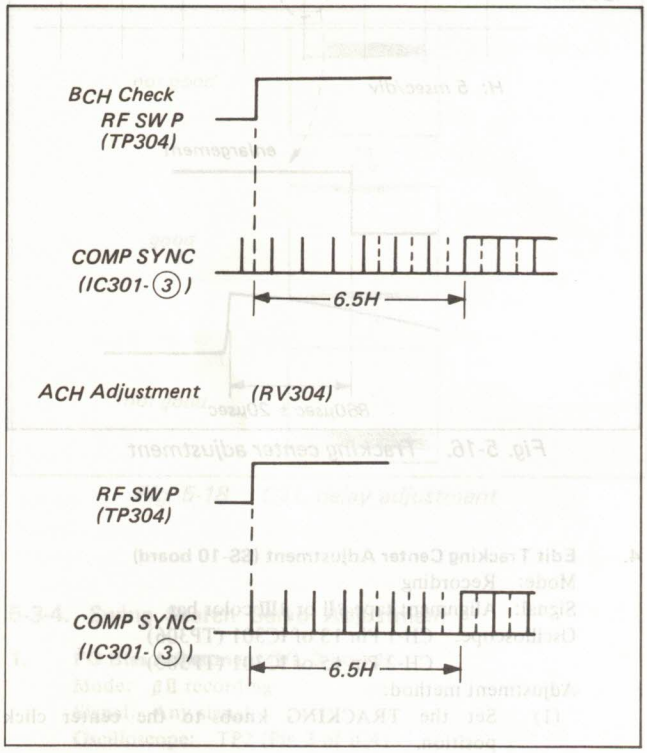


Fig. 5-10. RF switching position adjustment

5. BETA Scan, Drum Free Speed Adjustment (SS-10 board))

Mode: BETA scan

Signal: Alignment tape βIII color bar or monoscope

Oscilloscope: Pin 2 of CN305

Adjustment method:

Adjust to 63.62 μsec ± 0.1 μsec with RV303 (See Fig. 5-11).

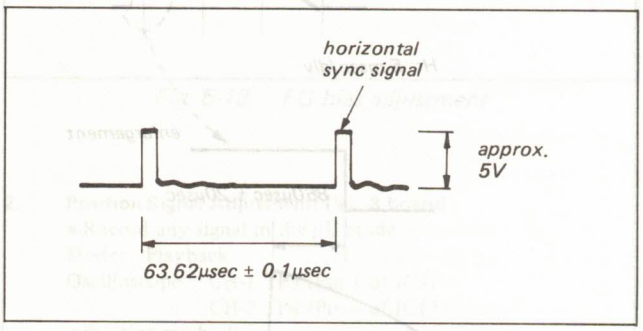


Fig. 5-11. Drum free speed adjustment

5-3-3. Capstan Servo System Alignment

1. Capstan DC Bias Adjustment (SS-10 board)

Mode: Playback

Signal: Color bar from alignment tape βI, βII, βIII or monoscope

Oscilloscope: Pin 20 of IC301 (TP302)

Adjustment method:

Adjust to the relevant duty (ratio for A and B) in the play mode with the RV as shown in Table 1.

Playback Mode	Adjustment RV	Duty
βIII	RV306	50%
βII	RV309	50%
βII + x2	RV307	60%
βIII + x2	RV308	50%
βII CUE	RV301	50%

Table 1.

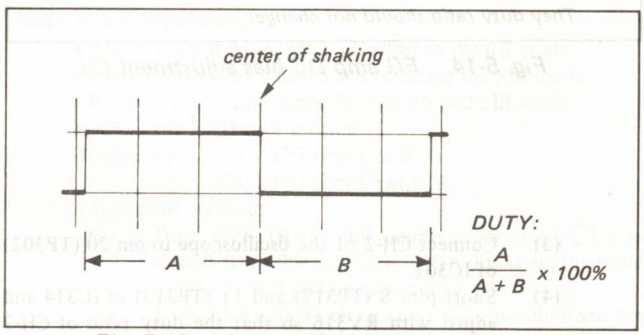


Fig. 5-12. Capstan DC bias adjustment

2. FG Amp DC Bias Adjustment (SS-10 board)

Mode: Playback

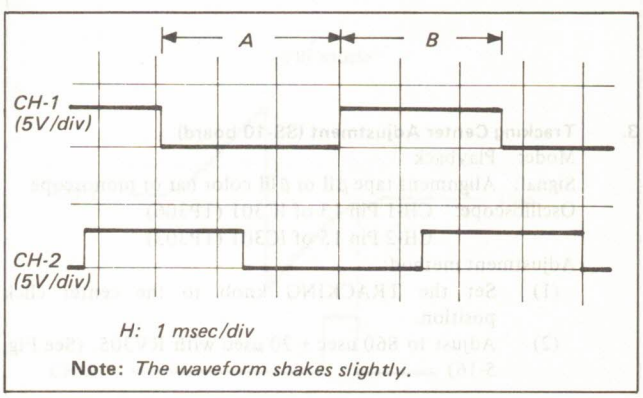
Signal: Alignment tape βII color bar or monoscope

Oscilloscope: CH-1 Pin 1 of IC306
CH-2 Pin 5 of IC306

Adjustment method:

(1) Short pins 8 (TP317) and 11 (TP313) of IC314 and adjust the duty ratio (between A and B) to about 50% with RV316 and RV315. (See Fig. 5-13)

Note: When the waveform does not lock and the playback picture is disturbed during adjustment, the video cassette recorder stops automatically. Set up the playback mode and adjust again.



Note: *The waveform shakes slightly.*

Fig. 5-13. FG amp DC bias adjustment (1)

(2) Repeat shorting and opening pins 8 (TP317) and 11 (TP313) of IC314 successively and adjust so that the duty ratio (between A and B) of CH-1 waveform does not change, with RV315. (See Fig. 5-14)

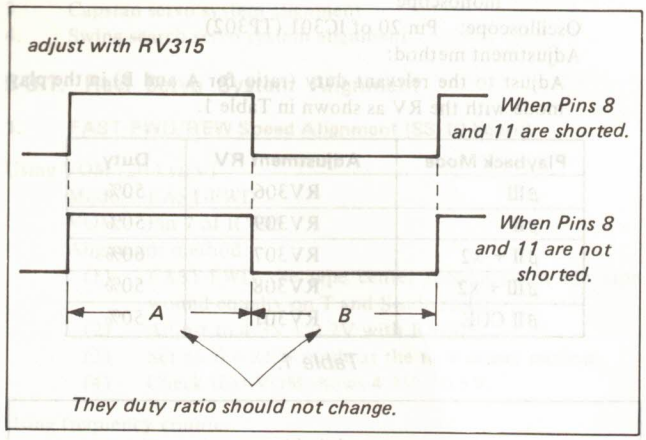


Fig. 5-14. FG amp DC bias adjustment (2)

(3) Connect CH-2 of the oscilloscope to pin 20 (TP302) of IC301.

(4) Short pins 8 (TP317) and 11 (TP313) of IC314 and adjust with RV316 so that the duty ratio of CH-2 waveform becomes 45%. (See Fig. 5-15)

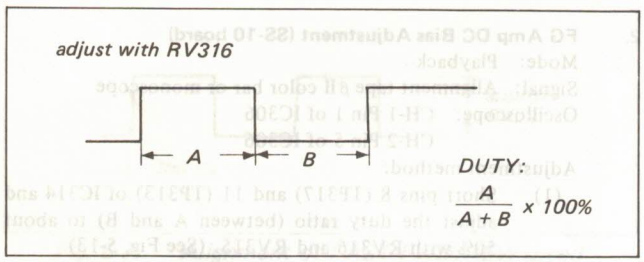


Fig. 5-15. FG amp DC bias adjustment (3)

3. Tracking Center Adjustment (SS-10 board)

Mode: Playback
Signal: Alignment tape βII or βIII color bar or monoscope
Oscilloscope: CH-1 Pin 13 of IC301 (TP306)
CH-2 Pin 15 of IC301 (TP303)
Adjustment method:

(1) Set the TRACKING knob to the center click position.

(2) Adjust to 860 μsec ± 20 μsec with RV305. (See Fig. 5-16)

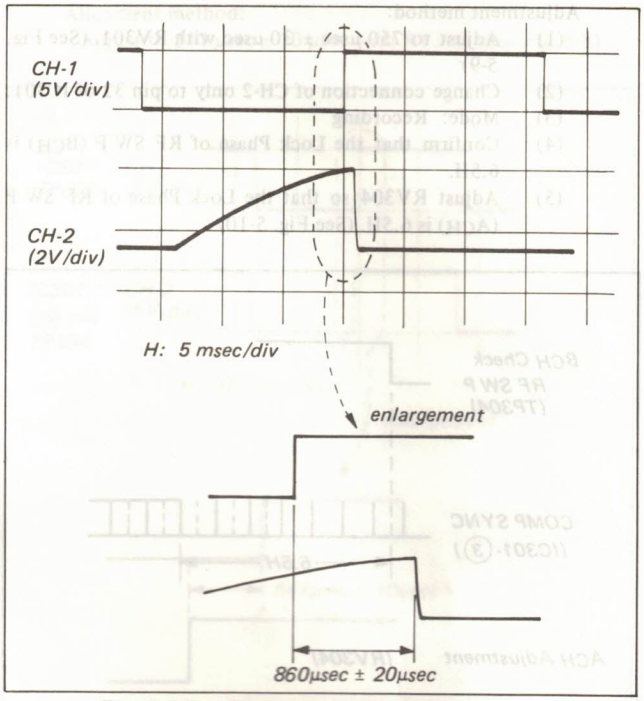


Fig. 5-16. Tracking center adjustment

4. Edit Tracking Center Adjustment (SS-10 board)

Mode: Recording
Signal: Alignment tape βII or βIII color bar
Oscilloscope: CH-1 Pin 13 of IC301 (TP306)
CH-2 Pin 15 of IC301 (TP303)
Adjustment method:

(1) Set the TRACKING knob to the center click position.

(2) Adjust to 860 μsec ± 20 μsec with RV314. (See Fig. 5-17)

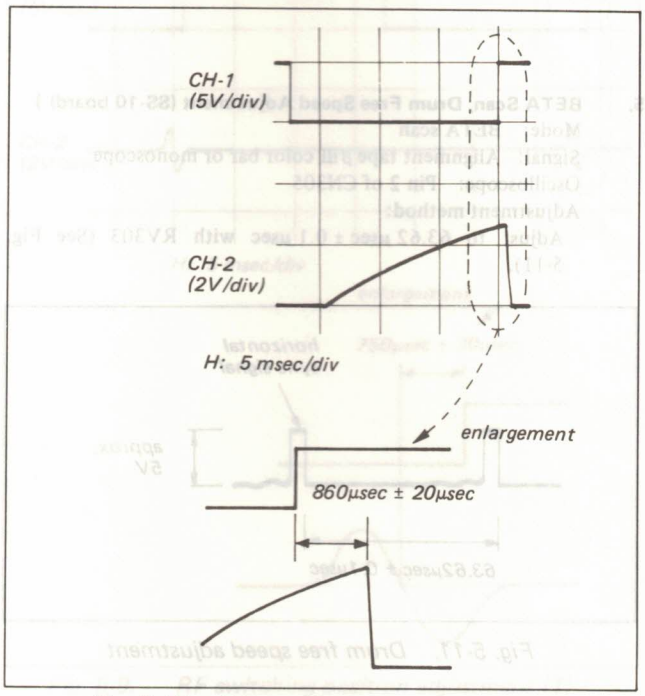


Fig. 5-17. Edit tracking center adjustment

5. CTL Delay Adjustment (SS-10 board)

Mode: X1 RVS (Swing Search)
Signal: Color bar signals recorded in βIII mode.
Adjustment method:
(1) Set the TRACKING knob to the center click position.
(2) Adjust RV317 so that noise bars on the TV monitor screen disappear from the screen top or bottom (or are kept to a minimum). (See Fig. 5-18)

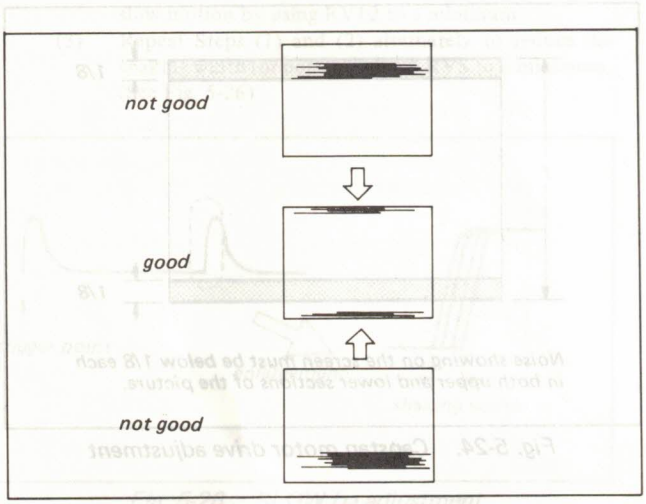


Fig. 5-18. CTL delay adjustment

5-3-4. Swing Search Servo Adjustment

1. FG Bias Adjustment (VL-3 board)

Mode: βII recording
Signal: Any signal
Oscilloscope: TP2 (Pin 3 of IC4)
Adjusting method:
(1) Reduce the shaking width to a minimum by RV3. (See Fig. 5-19)

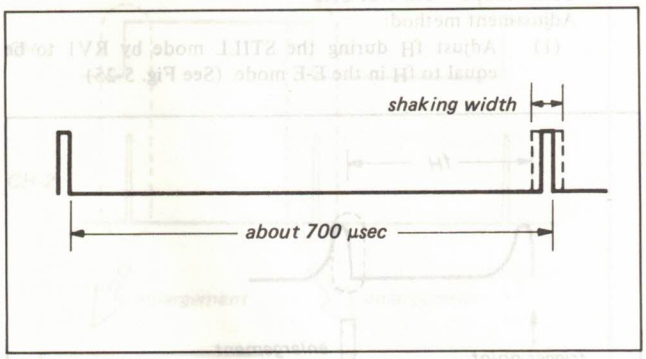


Fig. 5-19. FG bias adjustment

2. Position Signal Adjustment (VL-3 board)

• Record any signal in the βII mode.
Mode: Playback
Oscilloscope: CH-1 TP3 (Pin 1 of IC3)
CH-2 TP4 (Pin 4 of IC13)
Adjusting method:
(1) Reduce the step to a minimum by RV2. (See Fig. 5-20)

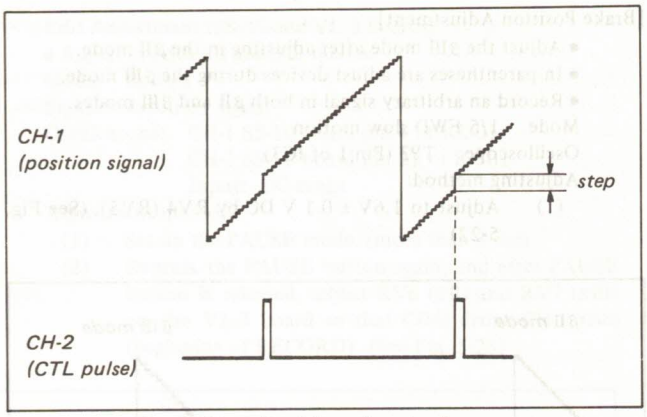


Fig. 5-20. Position signal adjustment

3. Slow Motion Adjustment

[Brake Width Adjustment]
• Adjust the βIII mode after adjusting in the βII mode.
• In parentheses are adjust devices during the βIII mode.
• Record an arbitrary signal in both βII and βIII modes.
Mode: 1/5 FWD slow motion
Oscilloscope: CH-1 TP3 (Pin 1 of IC3)
CH-2 TP7 (Pin 10 of IC9)
Adjustment method:
(1) Turn RV8 (RV9) full counterclockwise (↺) as viewed from the pattern side. (In this state, the pulse width of CH-2 will be minimum.)
(2) Turn RV8 (RV9) clockwise (↻) to eliminate the step. (See Fig. 5-21)

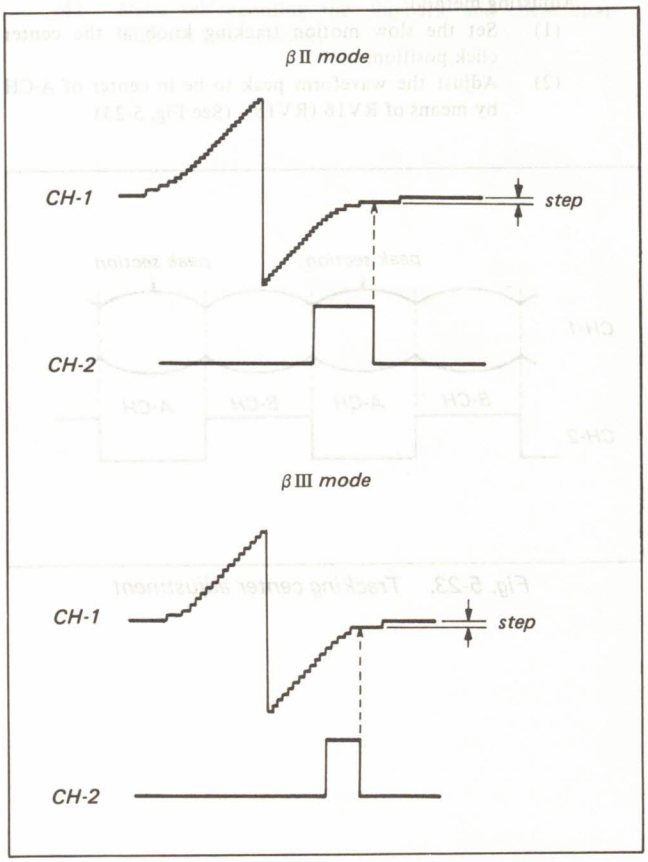


Fig. 5-21. Brake width adjustment

[Brake Position Adjustment]

- Adjust the βIII mode after adjusting in the βII mode.
- In parentheses are adjust devices during the βIII mode.
- Record an arbitrary signal in both βII and βIII modes.

Mode: 1/5 FWD slow motion
Oscilloscope: TP3 (Pin 1 of IC3)
Adjusting method:

(1) Adjust to 1.6V ± 0.1 V DC by RV4 (RV5). (See Fig. 5-22)

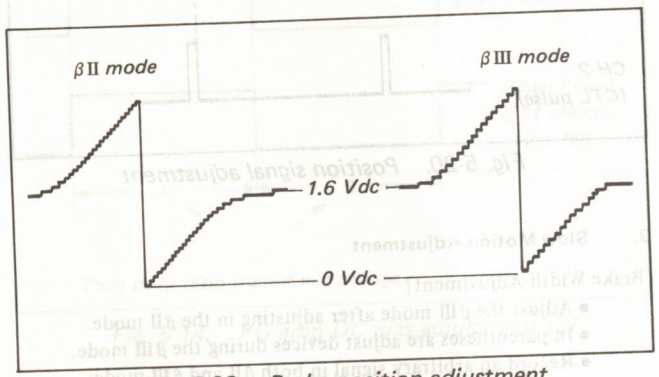


Fig. 5-22. Brake position adjustment

[Tracking Center Adjustment]

- Adjust the βIII mode after adjusting in the βII mode.
- In parentheses are adjust devices during the βIII mode.
- Record an arbitrary signal in both βII and βIII modes.

Mode: 1/5 FWD slow motion
Oscilloscope: CH-1 Pin 3 of CN2 on VA-3 board
CH-2 Pin 1 of CN2 on VA-3 board
Adjusting method:

(1) Set the slow motion tracking knob at the center click position.
(2) Adjust the waveform peak to be in center of A-CH by means of RV16 (RV18). (See Fig. 5-23)

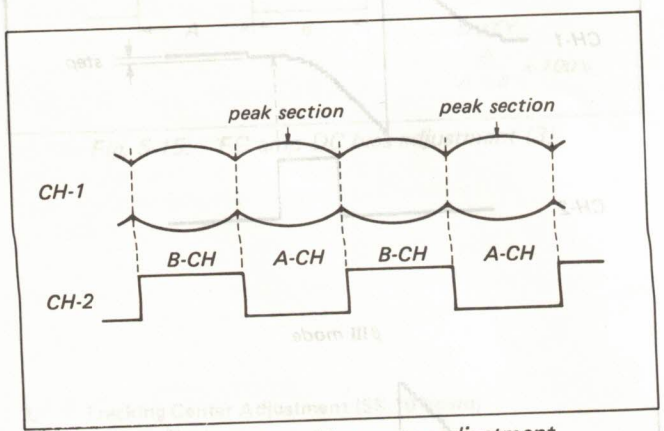


Fig. 5-23. Tracking center adjustment

[Capstan Motor Drive Adjustment]

- Record an arbitrary signal in the βII mode.

Mode: 1/5 RVS slow motion
Adjusting method:

(1) Adjust to conceal noise below or above the screen as best as you can by RV17 while watching the monitor TV set. (See Fig. 5-24)
(2) Make sure that is no noise when in the still mode.

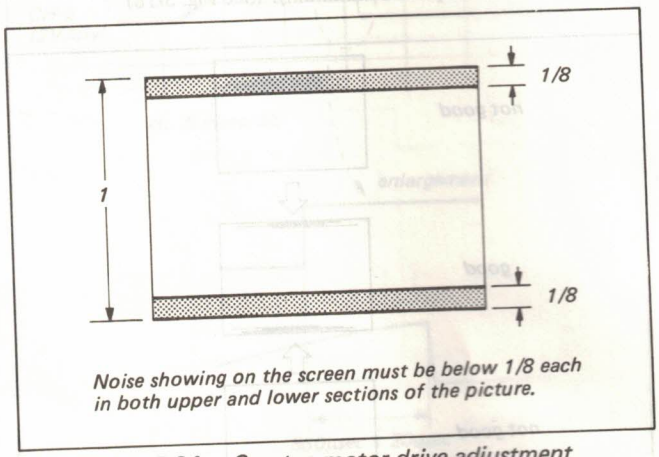


Fig. 5-24. Capstan motor drive adjustment

(3) There shall be no noise in the FWD FRAME-BY-FRAME mode. Make sure that noise in the 1/5 REV SLOW MOTION and REV FRAME-BY-FRAME modes is within the range shown in Fig. 5-24. .

4. Drum Shift Adjustment

[STILL f_H Adjustment]

Signal: Alignment tape βII color bar signal, or monoscope signal
Mode: STILL
Oscilloscope: Pin 1 of CN3
Adjustment method:

(1) Adjust f_H during the STILL mode by RV1 to be equal to f_H in the E-E mode. (See Fig. 5-25)

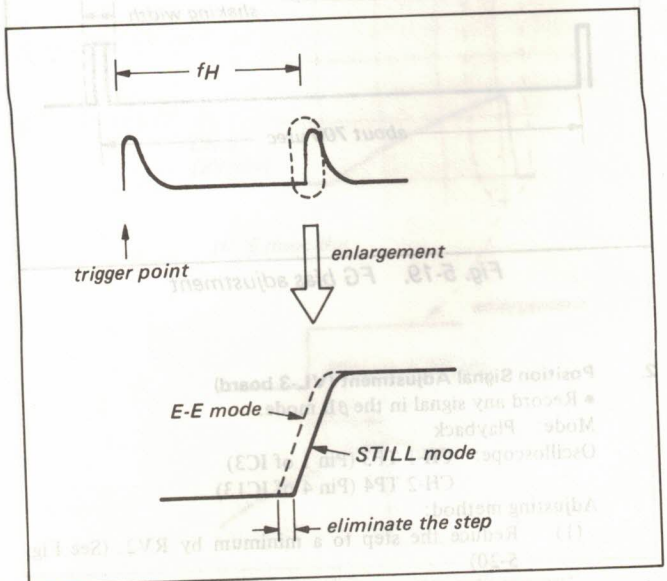


Fig. 5-25. STILL f_H adjustment

[SLOW f_H Adjustment]

Signal: Alignment tape βII color bar signal, or monoscope signal

Mode: 1/5 FWD slow motion and 1/5 RVS slow motion.

Oscilloscope: Pin 1 of CN3

Adjusting method:

(1) Reduce the shaking width of f_H by RV13 during 1/5 FWD slow motion to a minimum. (See Fig. 5-26)

(2) Reduce the shaking width of f_H during the 1/5 RVS slow motion by using RV12 to a minimum.

(3) Repeat Steps (1) and (2) alternately to reduce the shaking width for both FWD and RVS to a minimum. (See Fig. 5-26)

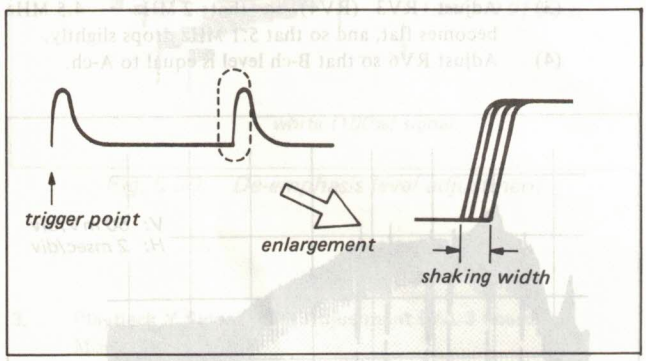


Fig. 5-26. SLOW f_H adjustment

5. VD Adjustment

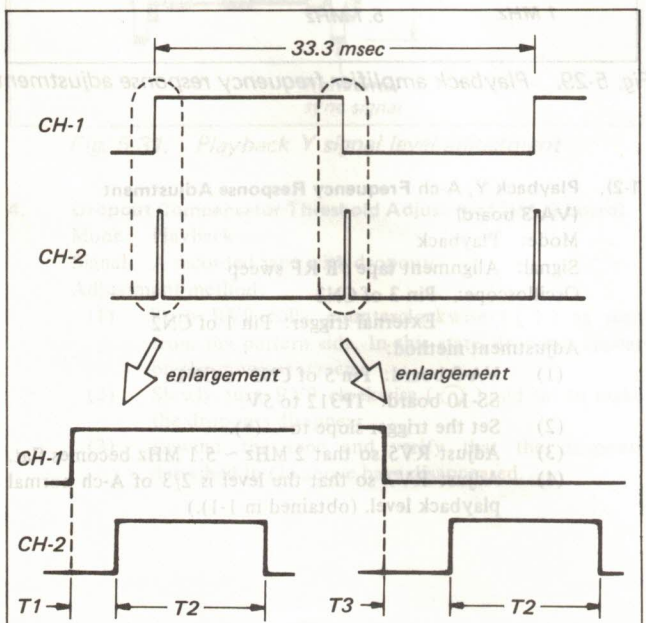
Signal: Alignment tape βIII color bar signal or monoscope signal.

Mode: STILL

Oscilloscope: CH-1 Pin 1 of CN2
CH-2 Pin 7 of CN3

Adjusting method:

(1) Adjust as shown in Fig. 5-27 by using RV11, RV15, and RV10.



T1: Adjust to 170 µsec ± 5 µsec by RV11.
T2: Adjust to 570 µsec ± 20 µsec by RV15.
T3: Adjust to 232 µsec ± 5 µsec by RV10.

Note: *Adjust RV10 after adjusting RV11.*

Fig. 5-27. VD adjustment

6. Edit Adjustment (SS-10 and VL-3 boards)

• Adjust in both βII and βIII modes.

Mode: Record

Signal: Arbitrary signal

Oscilloscope: CH-1 SS-10 board pin 4 of IC301
CH-2 SS-10 board pin 21 of IC301
Input: DC range

Adjustment method:

(1) Set up the PAUSE mode. (more than 3 sec)

(2) Depress the PAUSE button again, and after PAUSE button is released, adjust RV6 (βII) and RV7 (βIII) on the VL-3 board so that CH-2 drops CH-1 rises (beginning of RECORD). (See Fig. 5-28)

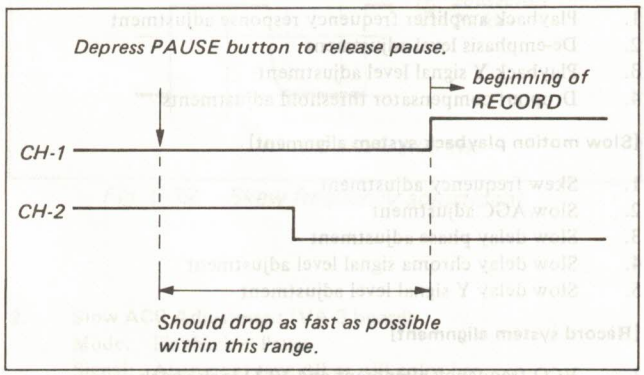


Fig. 5-28. Edit adjustment

(3) Repeat; PAUSE - - - - release of PAUSE two or three times, and check that the result meets Paragraph (2).

(4) Make self-recording the playback and check that edits are free of noise.

5-4. VIDEO SYSTEM ALIGNMENT

As a rule, first the playback system is aligned with an alignment tape to check that it operates normally, then the recording system is aligned.

The alignment sequence is shown below. The Y signal and chroma signal systems are aligned for both playback and recording systems.

Color video signals supplied by the pattern generator is used for video system alignment in the record mode. Check that the sync and color burst signals conform to the specifications designated in "Preparatory Set-up for Alignment" in Fig. 5-29.

[Playback system alignment]

1. Playback amplifier frequency response adjustment
2. De-emphasis level adjustment
3. Playback Y signal level adjustment
4. Dropout compensator threshold adjustments

[Slow motion playback system alignment]

1. Skew frequency adjustment
2. Slow AGC adjustment
3. Slow delay phase adjustment
4. Slow delay chroma signal level adjustment
5. Slow delay Y signal level adjustment

[Record system alignment]

1. VCO frequency alignment and VCO lock check
2. Comb AGC adjustment
3. Sync and peak AGC adjustment
4. Comb filter adjustment
5. Sync top carrier frequency set adjustment
6. FM modulator deviation adjustment
7. White clip and dark clip adjustment
8. Y-FM record current
9. Chroma record current adjustment

5-4-1. Playback System Alignment

1-1). Playback Amplifier Frequency Response Adjustment (VA-3 board)

- Adjust both A- and B-ch.
- B-ch is indicated by ( ).

Mode: Playback
Signal: Alignment tape βII RF sweep
Oscilloscope: Pin 3 of CN2
External trigger: Pin 1 of CN2
Adjustment method:

(1) Increase the output level to maximum with the TRACKING knob.
(2) Set the trigger slope to – (+).
(3) Adjust RV3 (RV4) so that 2 MHz ~ 4.5 MHz becomes flat, and so that 5.1 MHz drops slightly.
(4) Adjust RV6 so that B-ch level is equal to A-ch.

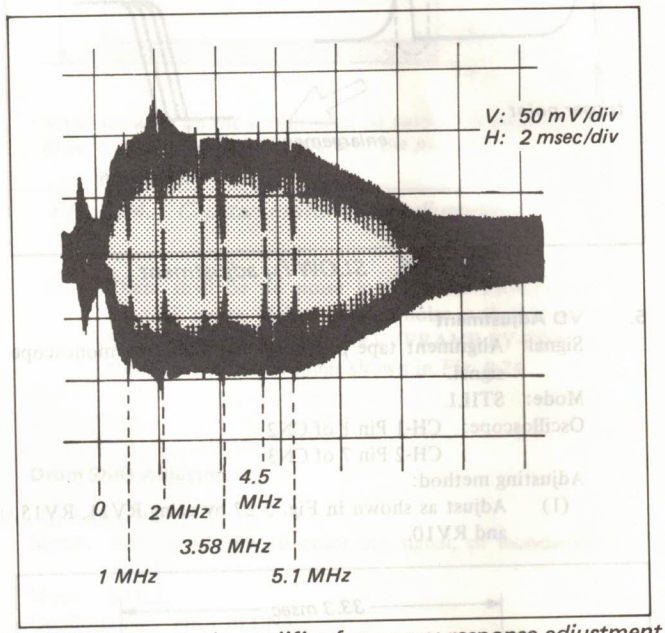


Fig. 5-29. Playback amplifier frequency response adjustment

1-2). Playback Y, A-ch Frequency Response Adjustment (VA-3 board)

Mode: Playback
Signal: Alignment tape βII RF sweep
Oscilloscope: Pin 3 of CN2
External trigger: Pin 1 of CN2
Adjustment method:

(1) VA-3 board: Pin 5 of CN2 to GND.
SS-10 board: TP312 to 5V.
(2) Set the trigger slope to – (+).
(3) Adjust RV5 so that 2 MHz ~ 5.1 MHz becomes flat.
(4) Adjust RV7 so that the level is 2/3 of A-ch normal playback level. (obtained in 1-1).)

2. **De-emphasis Level Adjustment (VA-3 board)**
Mode: Playback
Signal: Alignment tape βII color bar
Oscilloscope: Pin 16 of IC15
Adjustment method:
Adjust to 1.3V ± 0.01 Vp-p with RV10. (See Fig. 5-30)

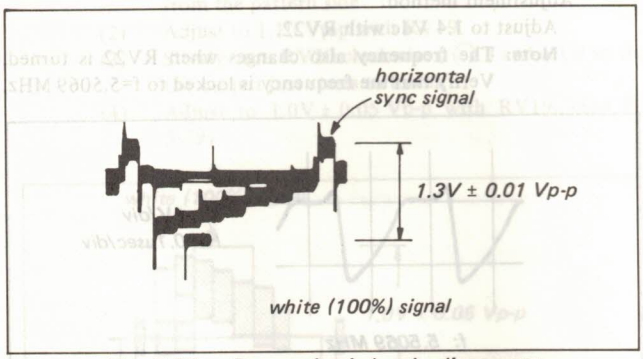


Fig. 5-30. De-emphasis level adjustment

3. **Playback Y Signal Level Adjustment (VA-3 board)**
Mode: Playback
Signal: Alignment tape βII color bar
Oscilloscope: Pin 4 of CN5
Adjustment method:
Adjust to 1.0V ± 0.05 Vp-p with RV15.

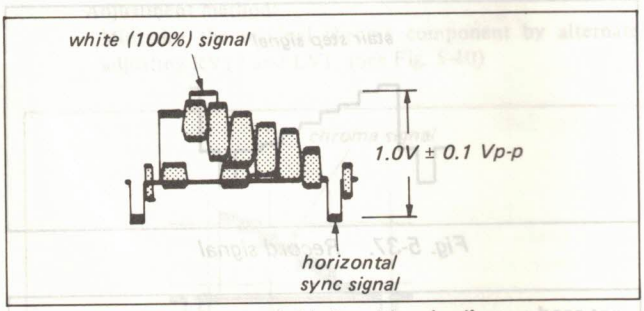


Fig. 5-31. Playback Y signal level adjustment

4. **Dropout Compensator Threshold Adjustment (VA-3 board)**
Mode: Playback
Signal: A recorded tape with dropouts
Adjustment method:
(1) Turn RV9 fully counterclockwise (↺) as seen from the pattern side. In this state, dropouts appear on the monitor screen.
(2) Slowly turn RV9 clockwise (↻) and set to make the dropouts disappear.
(3) Rewind the tape and verify that the dropouts described in (1) above have disappeared.

5-4-2. Slow Motion Playback System Alignment

1. **Skew Frequency Adjustment**
Mode: Playback + Pause
Signal: Unrecorded clean
Frequency counter: Pin 1 of IC011
Connection: Open CN3
Adjustment method:
Adjust to 16.0 kHz ± 0.05 kHz with RV025. (See Fig. 5-32)

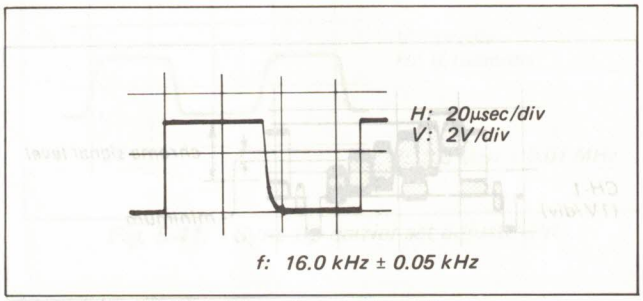


Fig. 5-32. Skew frequency adjustment

2. **Slow ACC Adjustment (VA-3 board)**
Mode: Playback + Pause
Signal: Alignment tape βII or βIII color bar
Oscilloscope: Pin 19 of IC011
Adjustment method:
Set for identical output levels during both playback and pause with RV026.

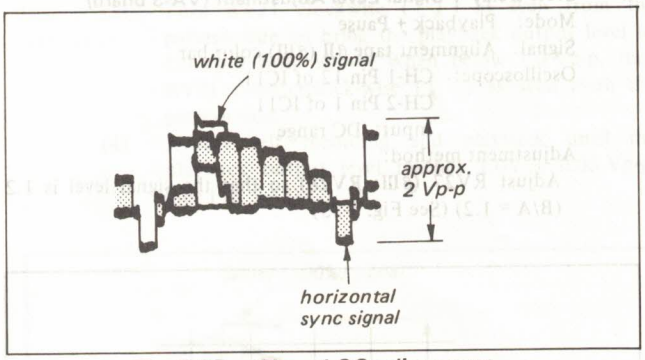


Fig. 5-33. Slow AGC adjustment

3. Slow Delay Chroma Signal Level Adjustment (VA-3 board)

Mode: Playback + Pause
Signal: Alignment tape βIII color bar
Oscilloscope: CH-1 TP2
Adjustment method:

(1) Adjust RV30 to minimize level deviation of chroma. (See Fig. 5-34)
(Confirm that flicker is the minimum on the monitor screen)

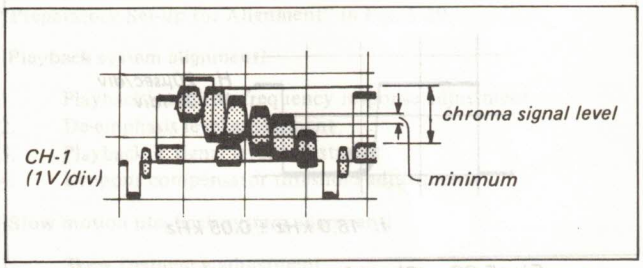


Fig. 5-34. Slow chroma signal level adjustment

(2) βII Pause mode
Adjust RV29 to minimize level deviation of chroma.

4. Slow Delay Y Signal Level Adjustment (VA-3 board)

Mode: Playback + Pause
Signal: Alignment tape βII (βIII) color bar
Oscilloscope: CH-1 Pin 12 of IC11
CH-2 Pin 1 of IC11
Input: DC range
Adjustment method:
Adjust RV27 (βIII: RV28) so that the signal level is 1.2 (B/A = 1.2) (See Fig. 5-35)

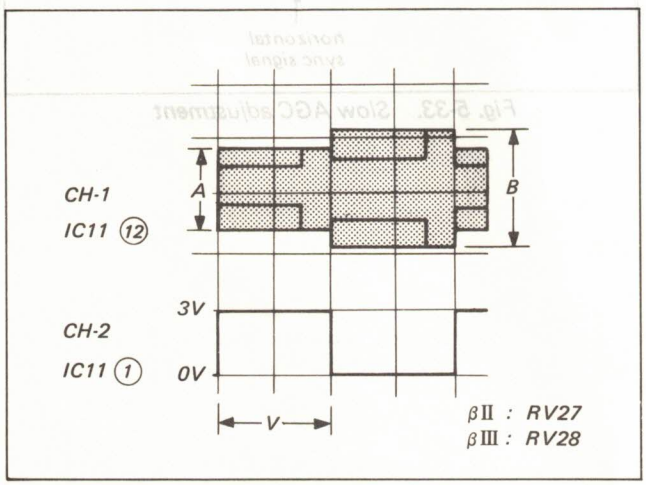


Fig. 5-35. Slow delay Y signal level adjustment

5-4-3. Record System Alignment

1. VCO Frequency Alignment and VCO Lock Check

Mode: Record or E-E
Signal: Color bar
Oscilloscope: CH-1 Pin 6 of IC10 CH-2 ⊕ of C95
Frequency counter: Pin 6 of IC10
Adjustment method:
Adjust to 1.4 Vdc with RV22.
Note: The frequency also changes when RV22 is turned. Verify that the frequency is locked to f=5.5069 MHz.

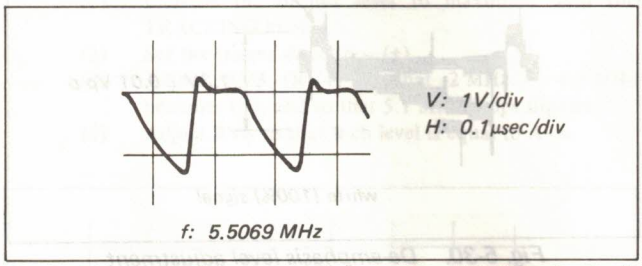


Fig. 5-36. VCO frequency alignment and VCO lock check

2. Comb AGC Alignment (VA-3 board)

Mode: Record or E-E
Signal: Color bar
Oscilloscope: Pin 8 of IC5 (Attach 22 kΩ resistor to tip of probe (10:1))
Adjustment method:
Adjust to eliminate level differences for each H step with RV16. (See Fig. 5-38)

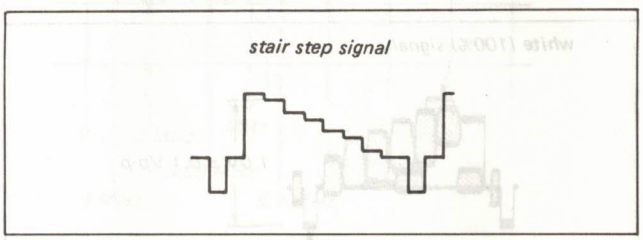


Fig. 5-37. Record signal

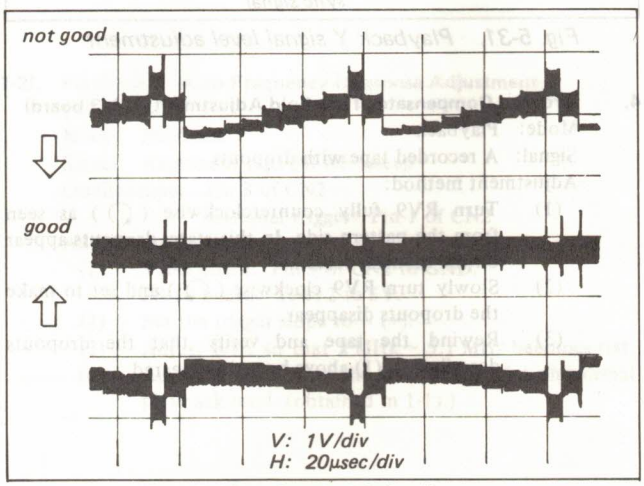


Fig. 5-38. Comb AGC adjustment

3. **Sync AGC and Peak AGC Alignment (VA-3 board)**
Mode: Record or E-E
Signal: Color Bar
Oscilloscope: Pin 4 of CN5
Adjustment method:
(1) Turn RV20 fully counterclockwise (↺) as seen from the pattern side.
(2) Adjust to 1.10 Vp-p with RV19.
(3) Slowly turn RV20 clockwise (↻) and set it so that the output just starts to lower.
(4) Adjust to 1.0V ± 0.05 Vp-p with RV19. (See Fig. 5-39)

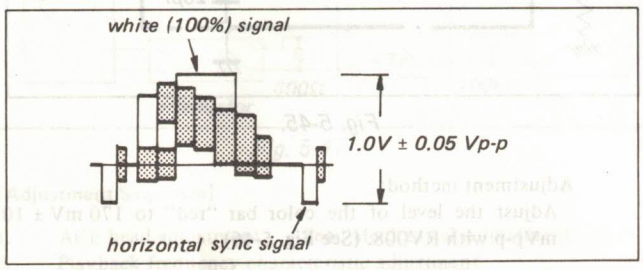


Fig. 5-39. Sync and peak AGC adjustment

4. **Comb Filter Adjustment (VA-3 board)**
Mode: Record or E-E
Signal: Color bar
Oscilloscope: Pin 9 of IC4
Adjustment method:
Minimize the residual chroma component by alternately adjusting RV17 and LV1. (See Fig. 5-40)

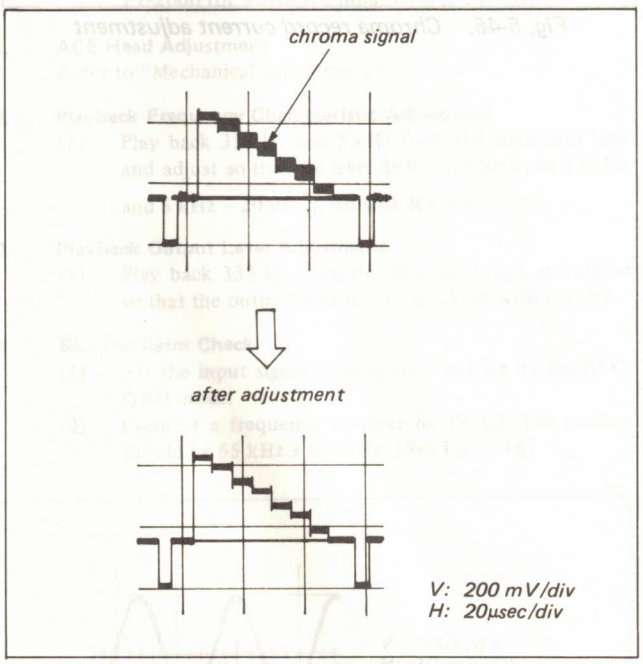


Fig. 5-40. Comb filter adjustment

5. **Sync Tip Carrier Set Adjustment (VA-3 board)**
Mode: Record
Signal: None
Frequency counter: Pin 4 of CN3
Adjustment method:
Adjust to 3.6 MHz ± 0.01 MHz with RV11. (See Fig. 5-41)

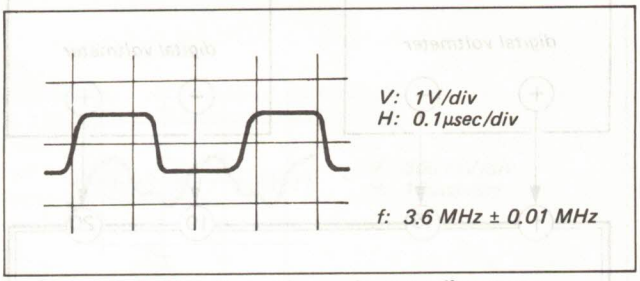


Fig. 5-41. Sync tip carrier set adjustment

6. **FM Modulator Deviation Adjustment (VA-3 board)**
• *The playback adjustment system and the SYNC tip carrier set adjustment in Paragraph 14 above must be completed* before making this adjustment.
Mode: βII self-recording and playback
Signal: Color bar
Oscilloscope: Pin 4 of CN5
Adjustment method:
(1) Set RV21 to its mechanical center position.
(2) Check the playback output level with self recording and playback.
(3) Turn RV21 clockwise (↻) as seen from the pattern side to bring the playback output level to 1.0 Vp-p from above. When below 1.0 Vp-p, turn RV21 counterclock-wise (↺) as seen from the pattern side.
(4) Repeat self recording and playback until the playback output level reaches 1.0V ± 0.05 Vp-p. (See Fig. 5-42)

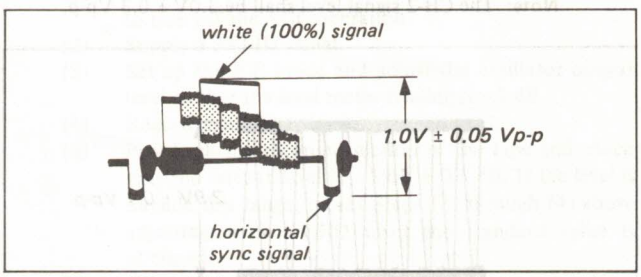


Fig. 5-42. FM modulator deviation adjustment

7. **White Clip and Dark Clip Adjustment (VA-3 board)**
Mode: Record or E-E
Signal: None
Digital voltmeter: See Fig. 5-43

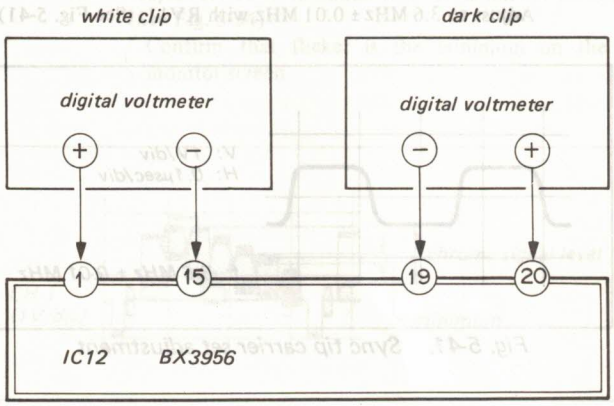


Fig. 5-43. Connection

Adjusting white clip: Adjust to 0.1V ± 0.01V with RV12.
Adjusting dark clip: Adjust to zero potential difference with RV13.

8. **Y-FM Record Current Adjustment (VA-3 board)**
Mode: βII record
Note: Be careful to set to RECORD mode after first clearing the E-E mode when making this adjustment.
Signal: None
Oscilloscope: CH-1 TP4
CH-2 TP6
Adjustment method:
Adjust the CH-1 signal level to 2.9V ± 0.1 Vp-p with RV001. (See Fig. 5-44)
Note: The CH-2 signal level shall be 3.0V ± 0.3 Vp-p.

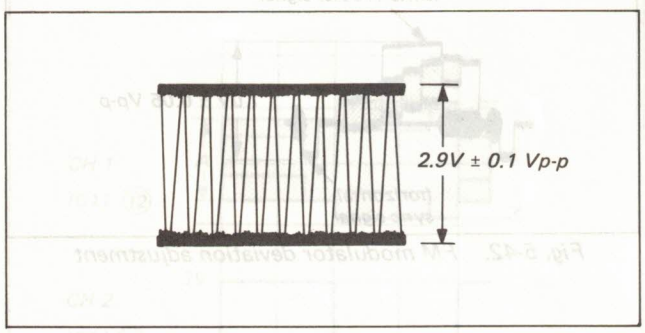


Fig. 5-44. Y-FM record current adjustment

9. **Chroma Record Current Adjustment (VA-3 board)**
Mode: Record
Signal: Color bar
Oscilloscope: Emitter of Q25

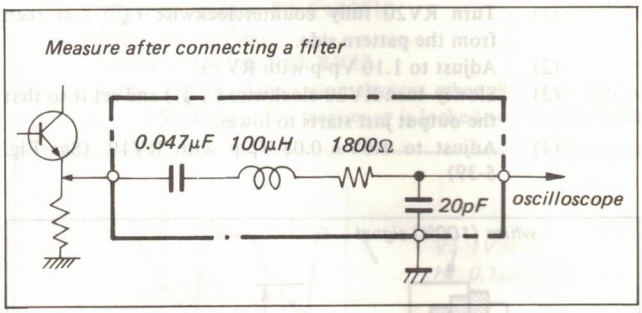


Fig. 5-45.

Adjustment method:
Adjust the level of the color bar "red" to 170 mV ± 10 mVp-p with RV008. (See Fig. 5-46)

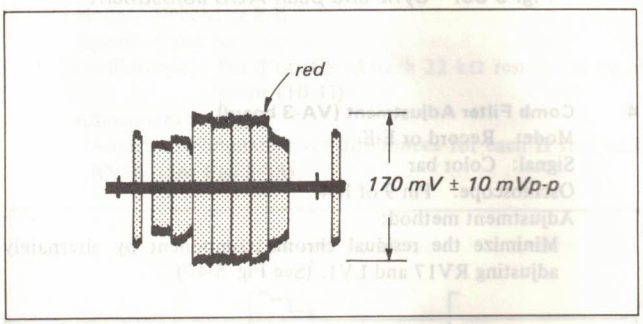


Fig. 5-46. Chroma record current adjustment

5-5. AUDIO SYSTEM ADJUSTMENT (VA-3 BOARD)

All adjustments of the audio system shall be made only in the βIII mode. No adjustments in the βI or βII modes are required. Use a Dynamicron tape for adjustments.

[Connection of Related Equipment]

- When using AC-220 (AC power supply)

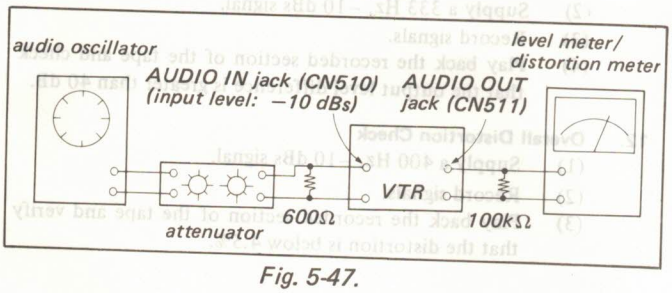


Fig. 5-47.

[Adjustment Sequence]

1. ACE head adjustment . . . See "Mechanical Adjustment"
2. Playback frequency characteristic adjustment
3. Playback output level adjustment
4. Bias oscillator check
5. Bias trap adjustment
6. Record bias adjustment
7. Record current adjustment
8. Audio dubbing bias adjustment and check
9. Overall frequency characteristic check

*10. AGC output check
*11. Overall S/N check
*12. Overall distortion check

Note: The adjustment items marked * are for AC-220 and TT-2000 for which the input level is different.

1. ACE Head Adjustment

Refer to "Mechanical Adjustment"

2. Playback Frequency Characteristic Adjustment

(1) Play back 333 Hz and 5 kHz from the alignment tape and adjust so that the level difference between 333 Hz and 5 kHz $-20\ \text{dB}\ ^{+1}_{-0}$ dB with RV500.

3. Playback Output Level Adjustment

(1) Play back 333 Hz from the alignment tape and adjust so that the output level is −5 dB ± 1 dB with RV501.

4. Bias Oscillator Check

(1) Set the input signal level to zero and set up the REC-ORD mode.
(2) Connect a frequency counter to TP502. The reading should be 65 kHz ± 6.5 kHz. (See Fig. 5-48)

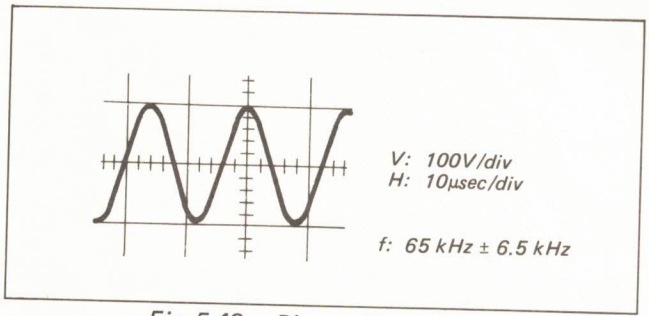


Fig. 5-48. Bias oscillator check

5. Bias Trap Adjustment

(1) Set the input signal level to zero and set up the REC-ORD mode.
(2) Connect an oscilloscope to TP506.
(3) Adjust LV501 for minimum bias leak.
Value: minimum level below 1.0 Vp-p. (See Fig. 5-49)

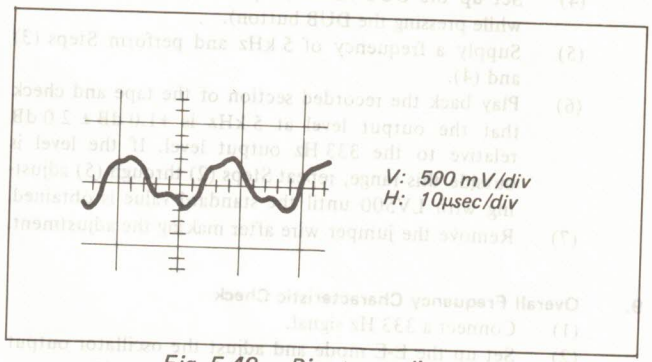


Fig. 5-49. Bias trap adjustment

6. Record Bias Adjustment

Check that "Playback frequency characteristic adjustment" has been made.

(1) Connect TP503 and ground with a jumper wire so as to turn off the AGC operation.
(2) Supply a 333 Hz signal.
(3) Set up the E-E mode and adjust the oscillator output level so that the level meter reading is −25 dB.
(4) Record signals.
(5) Supply a frequency of 5 kHz and perform Steps (3) and (4) above.
(6) Play back the recorded section of the tape and check that the output level at 5 kHz is +1.0 dB ± 1 dB relative to the output level at 333 Hz. If the level is outside this range, repeat Steps (2) through (5) adjusting with CT500 until the standard is met.
(7) Remove the jumper wire after making the adjustment.

7. Record Current Adjustment

(1) Connect TP503 and ground with a jumper wire so as to turn off the AGC operation.
(2) Supply a 333 Hz signal.
(3) Set up the E-E mode and adjust the oscillator output level so that the level meter reading is −5 dB.
(4) Record signals.
(5) Play back the recorded section of the tape and check that the output level is −5 dB ± 0.5 dB. If the level is outside this range, repeat Steps (2) through (4) above adjusting with RV502 until the standard value is obtained.
(6) Verify that the record current adjustment has been completed.
(7) Remove the jumper wire after making the adjustment.

8. Audio Dubbing Bias Adjustment and Check

(1) Connect TP503 and ground with a jumper wire so as to turn off the AGC operation.
(2) Supply a 333 Hz signal.
(3) Set up the E-E mode and adjust the oscillator output level so that the level meter reading is −25 dB.
(4) Set up the DUB mode (Depress the playback button while pressing the DUB button).
(5) Supply a frequency of 5 kHz and perform Steps (3) and (4).
(6) Play back the recorded section of the tape and check that the output level at 5 kHz is +1.0 dB ± 2.0 dB relative to the 333 Hz output level. If the level is outside this range, repeat Steps (2) through (5) adjusting with LV500 until the standard value is obtained.
(7) Remove the jumper wire after making the adjustment.

9. Overall Frequency Characteristic Check

(1) Connect a 333 Hz signal.
(2) Set up the E-E mode and adjust the oscillator output level so that the level meter reading is −25 dB.
(3) Record signals.
(4) Change the frequency to 50 Hz, 100 Hz, 3 kHz, 5 kHz and 7 kHz and repeat Steps (2) and (3).
(5) Play back the recorded section of the tape and verify that the level is within the specification. (See Fig. 5-50).

Standard values: With reference to the 333 Hz playback output level.

$$50\ \text{Hz}\ {}^{+2.5}_{-13}\ \text{dB}$$

$$100\ \text{Hz}\ {}^{+2.5}_{-5}\ \text{dB}$$

$$3\ \text{kHz}\ {}^{+3}_{-2}\ \text{dB}$$

$$5\ \text{kHz}\ {}^{+3.5}_{-1.5}\ \text{dB}$$

$$7\ \text{kHz}\ {}^{+2.5}_{-15}\ \text{dB}$$

(6) If the specified values cannot be attained, perform 2. Playback Frequency Characteristic Adjustment and 6. Record Bias Adjustment again.

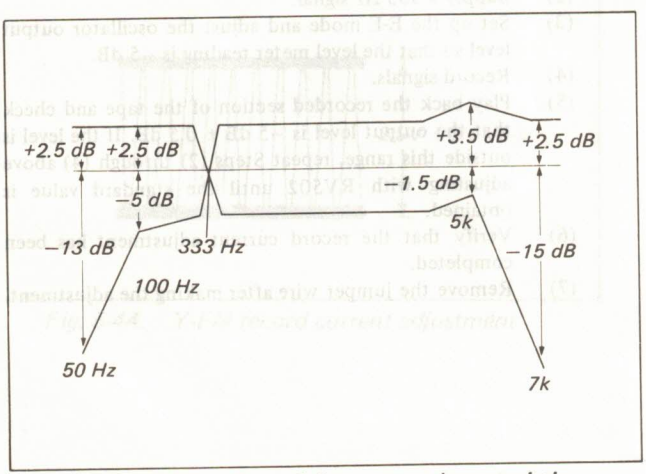


Fig. 5-50. Overall frequency characteristic

10. AGC Output Check

(1) Connect a 333 Hz, −10 dBs signal.
(2) Record signals.
(3) Play back the recorded section of the tape and check that the output level is −5 dB ± 2 dB.

11. Overall S/N Check

(1) Set the input signal level to zero and record signals.
(2) Supply a 333 Hz, −10 dBs signal.
(3) Record signals.
(4) Play back the recorded section of the tape and check that the output level difference is greater than 40 dB.

12. Overall Distortion Check

(1) Supply a 400 Hz, −10 dBs signal.
(2) Record signals.
(3) Play back the recorded section of the tape and verify that the distortion is below 4.5%.

5-6. TIMER ADJUSTMENT

CLOCK Adjustment

Whenever IC4 is replaced, be sure to make the following adjustments.

1. Connect a frequency counter to terminal TP (pin 26 of IC4) of the Timer Block.
2. Adjust C12 until the frequency counter indication reaches 349525.33 ± 1.05 Hz.

5-7. CHANNEL SELECTION ADJUSTMENT

CLOCK Adjustment

1. Connect a frequency counter to pin 3 of IC201.
2. Adjust T201 for a 15.6 kHz reading on the frequency counter.

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US Model
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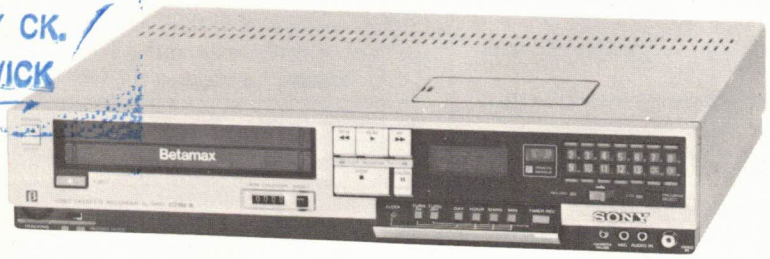

August, 1983

711B CHASSIS

Refer to separate adjustment manual, Part number 9-972-230-11

SPECIFICATIONS

System

Video recording system	Rotary two-head helical scanning
Video signal	EIA standards, NTSC color
Channel coverage	VHF channels 2 - 13 UHF channels 14 - 83
VHF output signal	Channel 3 or 4 (selectable) 75 ohms, unbalanced
Antenna	75-ohm external antenna terminal for VHF 300-ohm external antenna terminals for UHF

Video

Input	VIDEO IN : phono-type connector 1.0 V (p-p), 75 ohms, unbalanced, sync negative
Output	VIDEO OUT : phono-type connector 1.0 V (p-p), 75 ohms, unbalanced, sync negative
Signal-to-noise ratio	Better than 45 dB

Audio

Input	AUDIO IN : mini jack 100 k ohms, −10 dBs (0 dBs = 0.775 V rms) MIC : mini jack −60 dBs, suitable for microphone with 600-ohm impedance
Output	AUDIO OUT : mini jack Less than 10 k ohms, −5 dBs (100 k ohms load), unbalanced
Frequency response	ßII : 50 - 12,000 Hz ßIII : 50 - 9,000 Hz
Signal-to-noise ratio	Better than 40 dB

Tape transport

Tape speed	ßI : 4.0 cm/sec. (playback only) ßII : 2.0 cm/sec. ßIII : 1.33 cm/sec.
Maximum recording time	ßII : 3 hours 20 min. ßIII : 5 hours (with Sony L-830 cassette)
Fast forward time	Under 4 min. (L-500)
Rewind time	Under 4 min. (L-500)

Timer

Clock	Synchronized with the power frequency
Time indication	12-hour cycle
Timer setting	Only for recording 1 event/ 3 days

General

Power requirements	Type 1 : 120 V ac ±10%, 60 Hz ±0.5% Type 2 : 120 V ac ±10%, 50/60 Hz ±0.5% Type 3 / Type 4 : 120/220 V ac ±10%, 50/60 Hz ±0.5%
Power consumption	39.5 W
Operating temperature	5°C to 40°C (41°F to 104°F)
Storage temperature	−20°C to +65°C (−4°F to +149°F)
Dimensions	Approx. 430 × 80 × 385 mm (w/h/d) (17 × 3¼ × 15¼ inches) incl. projecting parts and controls
Weight	Approx. 9.6 kg (21 lb 3 oz)

— Continued on next page —

Beta ß VIDEO CASSETTE RECORDER

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Consumer VIDEO